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TM 10-4510-206-14

TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL

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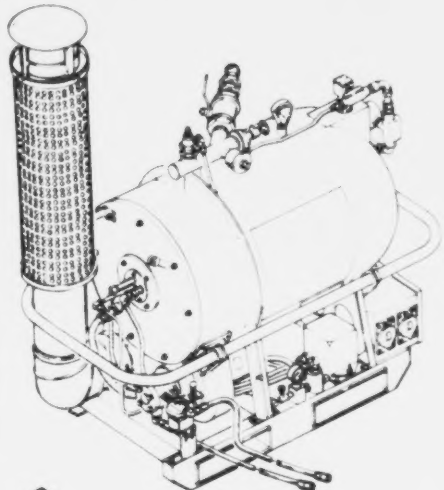

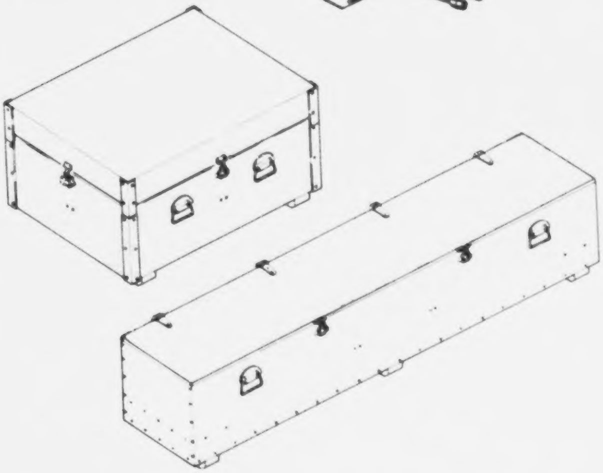

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BATH UNIT, PORTABLE, AUTOMATED, MULTI-HEAD MODEL PBU100

NSN 4510-01-139-4973

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6 JULY 1984

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CHANGE
NO. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 21 March 1988

Operator, Organizational, Direct Support, and General Support Maintenance Manual

BATH UNIT, PORTABLE, AUTOMATED, MULTI-HEAD MODEL PBU100

NSN 4510-01-139-4973

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1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages	Insert pages
i and ii	i and ii
1-1 and 1-2	1-1 and 1-2
6-7/6-8	6-7/6-8

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General, United States Army
Chief of Staff

Official:

R. L. DILWORTH
Brigadier General, United States Army
The Adjutant General

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To be distributed in accordance with DA Form 12-25A Operator, Unit, Direct Support and General Support Maintenance Requirements for Bath Unit, Portable, 8 Shower Head, M1958.

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Operator, Organizational Direct Support, and General Support Maintenance Manual

BATH UNIT, PORTABLE, AUTOMATED, MULTI-HEAD MODEL PBU100
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DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 28 February 1986

Operator, Organizational, Direct Support, and General Support Maintenance Manual

BATH UNIT, PORTABLE, AUTOMATED, MULTI-HEAD MODEL PBU100

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Remove pages	Insert pages
1-3 through 1-6	1-3 through 1-6
2-1 and 2-2	2-1 and 2-2
2-7 through 2-10	2-7 through 2-10
3-3 through 3-7/3-8	3-3 through 3-7/3-8
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B-5 through B-9/B-10	B-5 through B-9/B-10
FP-1/FP-2	FP-1/FP-2

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To be distributed in accordance with DA Form 12-25A Operator, Organizational, Direct Support and General Support Maintenance Requirements for Bath Unit, Portable, 8 Shower Head, M1958.

WARNING

ELECTRICAL SHOCK

Electric power furnished to the water heater can be hazardous to your life. Do not work with live circuits.

WARNING

ELECTRICAL SHOCK

Disconnect power cords before performing any maintenance on the water heater and the water pump.

WARNING

Do not operate the generator set without a suitable ground connection. Electrical defects in the unit, load lines, or load equipment can cause death by electrocution when contact is made with ungrounded system.

WARNING

ELECTRICAL SHOCK

Make certain the generator set is properly grounded before operating. Serious and possible fatal shock may result from contact with components carrying current while the bath unit is operating.

WARNING

EXPLOSION HAZARD

To eliminate the possiblity of explosion and injury to personnel by the accumulation of excess fuel vapors in the hot water heater combustion chamber during emergency shutdown or failure of the electrical power supply, the following steps will be taken before resuming normal operation:

a. Close burner fuel shutoff valve immediately.
b. Disconnect ignition electrodes at combustion chamber.
c. Restart unit and allow combustion chamber to be air purged for not less than three minutes before shutdown.
d. Reconnect ignition electrodes and resume normal operation.

WARNING

PERSONAL INJURY

Do not direct compressed air against the skin. Do not use compressed air for cleaning except where reduced to less than 30 psi (2.11 kg/cm^2) and then only with chip guarding and eye protection.

WARNING

FIRE HAZARD

Keep the fire extinguisher present, filled, and in operating condition so it can be used immediately in case of fire. When the extinguisher is not in use, keep it properly and securely mounted in its bracket on the baseboard.

WARNING

FIRE HAZARD

Do not permit oily waste or cleaning rags, oil, grease, fuel, rubbish or trash to collect around the bath unit as they create fire hazards.

WARNING

Fuel used with the bath unit is highly flammable and may be dangerous to human life if handled improperly. Tighten all fuel fittings firmly with a wrench to prevent leaks. Recheck all fittings when water heater is operating to ensure no fuel leaks with system under pressure.

WARNING

Use only fuel specified. Use of other fuels can cause injury or death to personnel.

WARNING

FIRE HAZARD

Keep constant watch for fuel leaks during bath unit operation, as leaking fuel may cause a fire hazard. Never refuel or handle gasoline or fuel oil when the bath unit is in operation. If fuel is spilled, it may cause a fire hazard. When refilling the fuel tank, do not smoke or use an open flame in the vicinity.

WARNING

Do not use any fuel container not specified. To do so may cause injury or death to personnel or damage to equipment.

WARNING

PERSONAL INJURY

Do not throw water on fire caused by defective electrical equipment as shock may result. Shut down the power source, and use carbon dioxide CO_2 fire extinguisher, sand, or dirt to put out fire.

WARNING

PERSONAL INJURY OR DEATH

Direct the exhaust fumes outside to ensure proper ventilation when operating the bath unit in a shelter or in a confined enclosure. Exhaust fumes are posionous and must not be inhaled by personnel.

WARNING

PERSONAL INJURY

Avoid coming in contact with the water heater exhaust duct during unit operation. The duct becomes extremely hot during operation, and serious burns or body injury may result from contact with the duct before it cools.

WARNING

DISEASE HAZARD

Operate the bath unit in conjunction with the water treatment procedures approved by the major command surgeon when the bath unit is used in areas where schistosomiasis is prevalent. Failure to do so may result in contacting schistosomiasis, an infectious disease, which may prove detrimental to humans. See TB MED 167. Position waste water drain so that waste water cannot re-enter water heater and circulating system.

WARNING

Do not connect water heater to untested water supply. Contaminated water can cause illness or death.

WARNING

FIRE HAZARD

Dry cleaning solvent, P-D-680 (Solvent), used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100°F to 138°F.

WARNING

PERSONAL INJURY

Dry cleaning solvent, P-D-680 (solvent) is potentially dangerous. Avoid repeated or prolonged breathing of vapors and skin contact with liquid. Do not use near open flame, arcing equipment, or other ignition sources. Use in well ventilated area.

TECHNICAL MANUAL

NO. 10-4510-206-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 6 July 1984

Operator, Organizational, Direct Support, and General Support Maintenance Manual

BATH UNIT, PORTABLE, AUTOMATED, MULTI-HEAD
MODEL PBU100
NSN 4510-01-139-4973

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistake or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, U.S. Army Troop Support Command, ATTN: AMSTR-MCTS, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798. A reply will be furnished directly to you.

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HOW TO USE THIS MANUAL

How-To-Use-This-Manual information describes the manual contents, format, features, use, and value to its user.

In this manual (TM 10-4510-206-14), use the front cover locators and marked pages to quickly find the parts of the manual shown on the cover. These portions of the manual were chosen because they are used often. Inside, the manual has been divided into chapters, sections, and paragraphs which are all numbered sequentially.

FINDING THE INSTRUCTIONS YOU NEED

1. How do you start?

Look at the front cover of this manual. On the right side you will find the listing "Equipment Description and Data". It tells you to go to page 1-3. You must familiarize yourself with your portable bath unit before beginning any task.

2. What do you do if you have a failure?

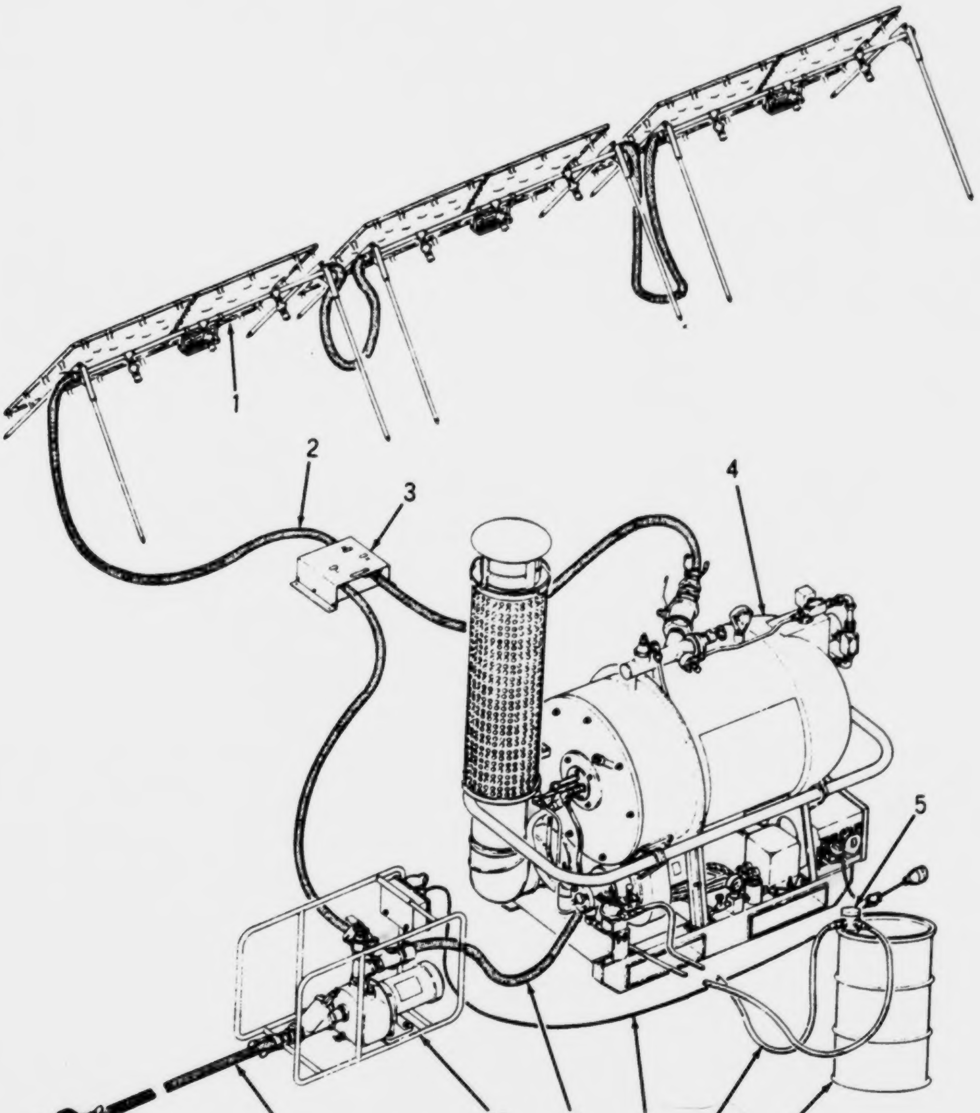
Look at the troubleshooting table and find your symptom. If, for example, the water pump fails to deliver water, you will find the symptom in table 3-1 item 6.

3. How do you fix a problem?

Follow the instructions in the troubleshooting table. Follow the procedure until the problem is fixed.

4. What if these procedures still do not fix the problem?

Take the unit to the next higher level of maintenance for repair.



1. SHOWER STAND	7. FUEL FEED AND RETURN HOSE ASSEMBLIES
2. WATER HOSE ASSEMBLIES	8. POWER CABLE ASSEMBLY
3. MIXING VALVE ASSEMBLY	9. WATER PUMP HEATER HOSE ASSEMBLY
4. WATER HEATER	10. WATER PUMP
5. FILL VENT ASSEMBLY	11. SUCTION HOSE ASSEMBLY
6. FUEL CONTAINER	12. SUCTION STRAINER ASSEMBLY

BATH UNIT MAJOR COMPONENTS

CHAPTER 1

INTRODUCTION

This chaper contains general information and equipment data for your Portable Bath Unit.

Section I. GENERAL INFORMATION

1-1. SCOPE

Type of Manual: Operator, Organizational, Direct Support, and General Support Maintenance.

Model Number and Equipment Name: PBU-100-Automated Multihead Portable Bath Unit.

Purpose of Equipment: Provides warm water for personnel to shower in the field.

1-2. MAINTENANCE FORMS AND RECORDS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750, The Army Maintenance Management System (TAMMS).

1-3. DESTRUCTION OF ARMY MATERIAL TO PREVENT ENEMY USE

Department of Army regulations and procedures for destruction of defense equipment to prevent enemy use will be those prescribed in TM 750-244-3, Procedures for Destruction of Equipment to Prevent Enemy Use (Mobility Equipment Command).

1-4. PREPARATION FOR STORAGE OR SHIPMENT

Refer to Chapter 4, Section VI.

1-5. OFFICIAL NOMENCLATURE, NAMES, AND DESIGNATIONS

NOMENCLATURE CROSS-REFERENCE LIST

Common Name	Official Nomenclature
Bath Unit	Automated Multihead Portable Bath Unit PBU 100
Water Heater	Water Heater Assembly
Water Pump	Water Pump Assembly
Accessories	Hose Assemblies Power Cable Assembly Shower Stand Assembly Water Pump Suction Strainer Assembly

1-6. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

If your portable Bath Unit needs improvement, let us know. Send us an EIR. You the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to us at Commander, US Army Troop Support Command, ATTN: AMSTR-QX, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798.

Section II. EQUIPMENT DESCRIPTION AND DATA

1-7. EQUIPMENT DESCRIPTION, CAPABILITIES, AND FEATURES

Characteristics

- Portable
- Provides warm water to three shower stands
- Shower heads individually controlled

Capabilities and Features

- Pumps and strains water from any source
- Units easily setup and maintained
- Fueled from oil drum or gas can

1-8. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

A. SHOWER STAND ASSEMBLY. Each of the three shower stand assemblies is equipped with three shower heads. Each shower head has a valve to control the water flow. A curtain is supplied to enclose each shower head.

B. WATER HOSE ASSEMBLY. Five 1-inch (25.4 mm) ID hoses, each measuring 7 1/2-feet (2.29 meters). The hoses interconnect the water pump assembly, water heater assembly, mixing valve assembly, and three shower stand assemblies.

C. MIXING VALVE ASSEMBLY. The mixing valve assembly mixes hot water from the water heater and cold water from the water pump and water source to provide heated water to the shower stands at approximately 105°F (40.5°C).

D. WATER HEATER. The water heater is a self-contained, liquified fuel-fired boiler that heats water supplied by the water pump. The major subassemblies or components that make up the water heater are water vessel, burner assembly, blower assembly, control box assembly, sight glass assembly, and transformer and ignition cables.

E. DRUM FILL ADAPTER ASSEMBLY. The drum fill adapter assembly can be used with either a 55-gallon (208.2 liter) fuel drum or a 5-gallon (18.9 liter) gasoline can. Fuel level can be visually checked and refueled without disconnecting fuel lines.

F. FUEL CONTAINER. The fuel container may be either a 55-gallon (208.2 liter) fuel drum or a 5-gallon (18.9 liter) gasoline can.

G. FUEL FEED AND RETURN HOSE ASSEMBLIES. Flexible hoses provide supply and return fuel between the fuel storage container and fuel pump assembly on the water heater.

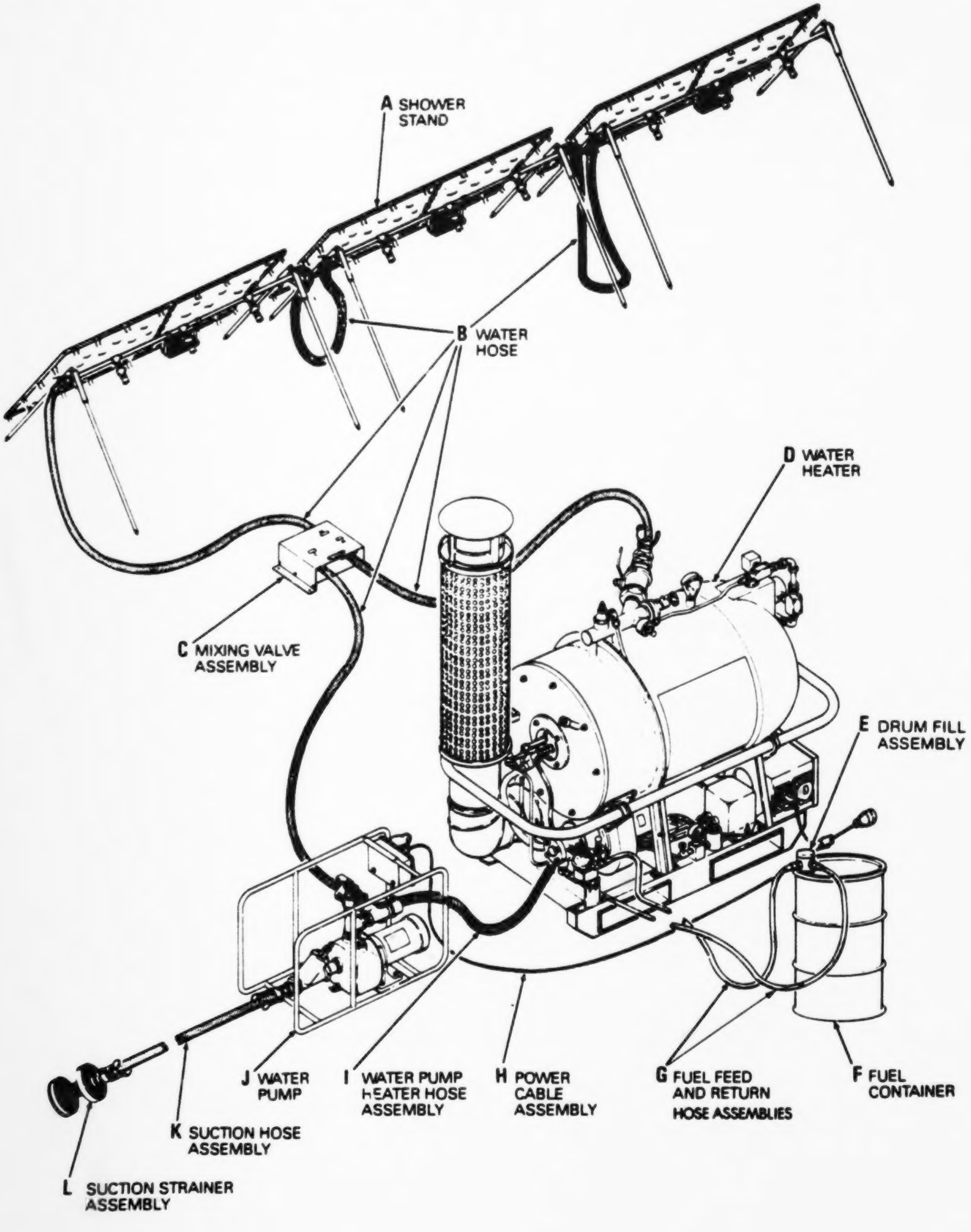
H. POWER CABLE ASSEMBLY. The power cable assembly consists of two cables that extend from the power source to the Bath Unit. The short cable connects to a 208 V, 3-phase power source. The long cable connects to the short cable, water heater, and water pump.

I. WATER PUMP-HEATER HOSE ASSEMBLY. One 1 1/2-inch (38.1 mm) ID hose measuring 6-feet (1.52 meters) connects the water pump to the water heater.

J. WATER PUMP. The water pump draws water from the water source through the intake hose and in-line strainer and supplies it through a discharge line to the water heater.

K. SUCTION HOSE ASSEMBLY. One 1-inch (25.4 mm) ID hose measuring 25 feet (7.62 meters) connects the water supply to the water pump.

L. SUCTION STRAINER ASSEMBLY. The suction strainer assembly is connected to the suction hose assembly. It prevents leaves and debris from entering the water system.


A SHOWER STAND
B WATER HOSE
C MIXING VALVE ASSEMBLY
D WATER HEATER
E DRUM FILL ASSEMBLY
F FUEL CONTAINER
G FUEL FEED AND RETURN HOSE ASSEMBLIES
H POWER CABLE ASSEMBLY
I WATER PUMP HEATER HOSE ASSEMBLY
J WATER PUMP
K SUCTION HOSE ASSEMBLY
L SUCTION STRAINER ASSEMBLY

1-9. EQUIPMENT DATA

Bath Unit

Weight (crated)	1065 pounds (483.1 kg)
Volume (crated)	74.9 ft^3 (2.12m^3)
Electrical	
Voltage	208 vac, 3-phase, 60 Hz
Power	1.2 kW at 5.7A
Fuel	
Type	#1 or #2 commercial fuel oil, VV-F800, diesel or any type of gasoline.
Consumption	5 gallons (18.93 liters)/hour

Water Heater

Dimensions:	
Length	52 inches (132 cm)
Height	47 inches (122 cm)
Width	27 inches (69 cm)
Weight (approximate)	465 pounds (210.92 kg)
Capacity (water)	23.7 gallons (89.7 liters)

Blower and Fuel Pump Motor

Power Rating	1/3 horsepower (249w)
Speed	3450 rpm

Water Pump

Type	Centrifugal, self-priming (after initial priming)
Dimensions:	
Length	31 inches (78 cm)
Height	19-1/2 inches (50 cm)
Width	15-3/4 inches (40 cm)
Weight (approximate)	70 pounds (31.75 kilograms)
Rate Capacity	20 gallons (75.7 liters)/minute
Motor	
Power rating	3/4 horsepower (560 W)
Speed	3450 rpm

Fuel Pump

Type	1-stage gear
Pressure	0-150 psi (0-1034kPa)

Shower Stand

Number	3
Nozzles Each	3

Height	82 inches (208 cm)
Water Discharge	2.2 gallons (8.3 L)/min.

Water Pump to Heater Hose Assembly

Number	1
Length	5 feet (1.52 m)
Diameter	1 1/2 inch (38.1 mm) ID

Interconnecting Water Hose Assemblies

1 inch (2.54 mm) x 7 1/2 feet (2.3 m)	4
1 inch (2.54 mm) x 25 feet (7.62 m)	3

Fire Extinguisher

Type	Carbon dioxide
Capacity	5 pounds (2.268 kg)
Weight (empty)	10 7/8 pounds (4.93 kg)
Weight of Horn	1/8 pound (0.057 kg)
Total Weight	16 pounds (7.26 kg)

1-10. SAFETY, CARE, AND HANDLING

a. General. New nine-shower head Bath Units are preserved, packaged, and crated to meet military requirements for domestic shipment. The unit is shipped with all attachments and equipment necessary for normal operation.

WARNING

Have all personnel clear the area before lifting the water heater.

b. Unloading Instruction. The crated water heater may be lifted by using a fork lift, crane, or other lifting device capable of lifting 1065 (483 kg) pounds safely. If a crane is used, arrange slings under packing crate carefully to ensure crate will not tip. If a fork lift is used, slide fork lift blades directly under crate between skid blocks.

c. Uncrating. Carefully uncrate unit, being sure not to damage water heater components. If the unit is to be recrated, exercise care to prevent damage to crating material.

WARNING

Clean up area and dispose of all packing material. Do not leave nails and other debris scattered around area.

d. Unpacking. Unpack all small components packaged and stored around the water vessel. These components can easily be lifted and removed from the packing skid by one or two persons. Then remove the water vessel assembly. It can be lifted and transported with a fork lift. Be sure to insert the fork lift arms completely through the water vessel skid before attempting to lift it.

NOTE

Be sure all components are accounted for. Check all packaging material for loose parts before discarding.

e. Servicing. Remove all protective compounds and covering such as waxed paper, waterproof tape, and barrier material and tape. Using dry wiping cloths, remove all preservatives and greases from unpainted, threaded, or exposed surfaces.

f. Inspection.

(1) Unwrap and examine separately wrapped items to ensure they are in serviceable condition.

(2) Visually inspect all components for damage. Check for dents, cracks, broken parts, and loose or kinked connections

(3) Check all instruments for damage.

(4) Check appendix C and ensure that all parts have been supplied.

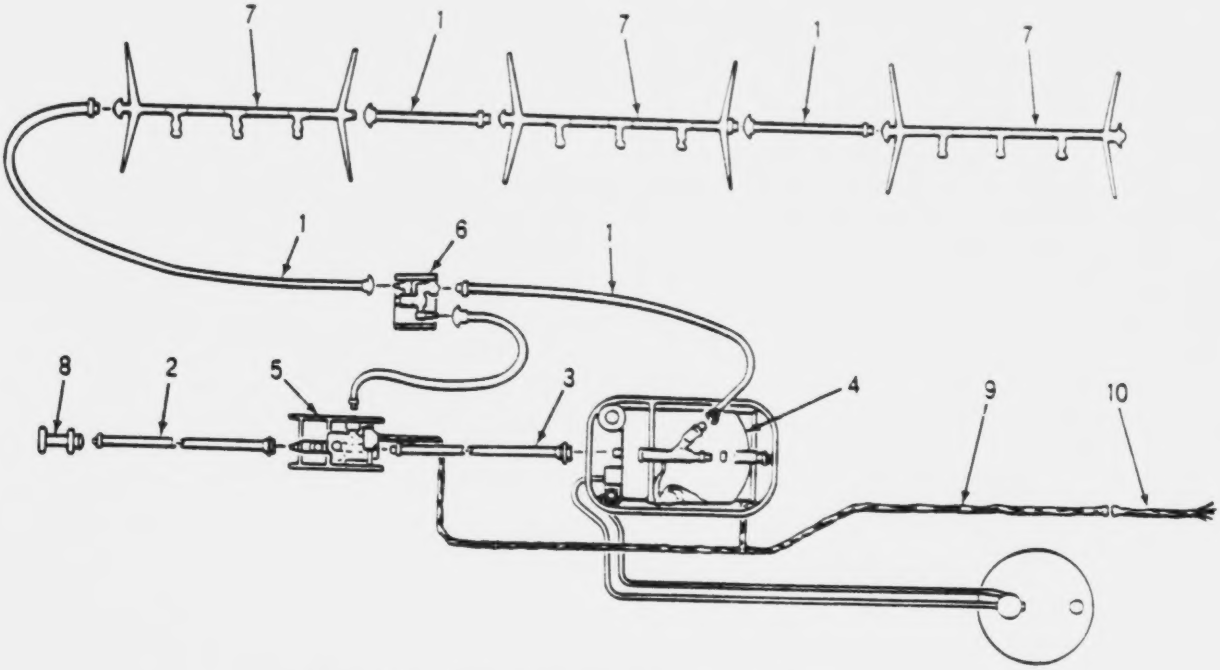
(5) Report any deficiencies or damaged parts to the proper authority.

Section III. TECHNICAL PRINCIPLES OF OPERATION

1-11. DESCRIPTION

The 9-shower head Portable Bath Unit is a liquid-fuel fired water heating device that supplies warm water to each of the shower nozzles. The Bath Unit is equipped with the necessary hoses (1, 2, and 3), water heater (4), water pump assembly (5), mixing unit (6), and shower stands (7) to supply all the warm water needed for operation. The water pump draws water through the suction strainer (8) and the hose from the water source (2) and forces it through the discharge hose (3) to the water heater. The water heater raises the temperature of the incoming water and maintains it at the desired temperature. The heated water is then forced through one discharge hose (1) to the mixing unit (6) where it is mixed with cold water to provide water at the desired temperature to shower heads.

The electric power (1.2 kW at 5.7 amps) required to operate the Bath Unit should be supplied by a self-contained portable 3 kW, 60-Hz, 208 V, 3-phase power generator source. All electrically operated components of the Bath Unit are grounded through a fifth wire incorporated in the power cables (9 and 10).



PORTABLE BATH UNIT FUNCTIONAL DIAGRAM

CHAPTER 2

OPERATING INSTRUCTIONS

This chapter tells you how to setup and operate the portable Bath Unit. The chapter includes the following sections:

SECTION I Description and Use of Operator's Controls and Indicators

II Operator Preventive Maintenance Checks and Services

III Operation Under Usual Conditions

IV Operation Under Unusual Conditions

V Operation of Auxiliary Equipment

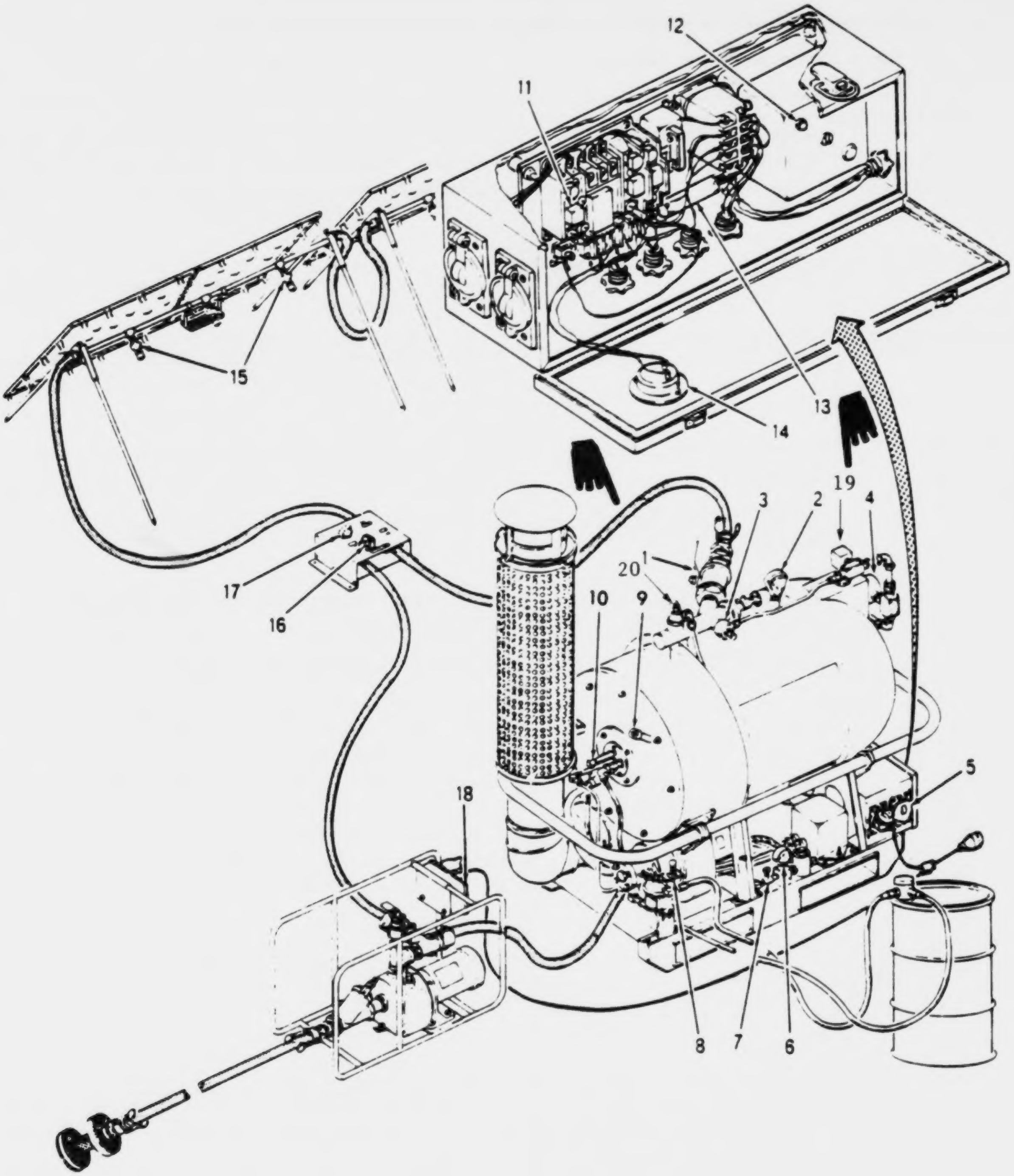
Section I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

2-1. GENERAL

This section tells the operator how to use various controls and instruments of the Bath Unit. The Bath Unit controls are located on the water heater and water pump. To ensure that the equipment is ready for operation at all times, it must be inspected systematically (as outlined in Section II of this chapter) before operation, during operation, and after operation so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance checks and services (PMCS) will be performed before operation. Defects discovered during operation of the unit will be noted, and correction made as soon as operation has ceased. Stop operation immediately if a deficiency is noted during operation which would damage the equipment. After operation, the necessary PMCS will be performed. Report defects or unsatisfactory operating characteristics beyond the scope of the operator to organizational maintenance at the earliest opportunity.

CONTROLS AND INDICATORS

Key	Control or Indicator	Function
1	Hot Water Output Valve	Controls hot water output from the water heater to the mixing valve.
2	Water Temperature Gage	Indicates temperature of water inside water heater.
3	High Limit Control	Preset at the factory. Operates when operating control (4) fails. Deactivates fuel solenoid valve when water temperature exceeds 190°F (88°C) turning off fuel to the water heater.
4	Operating Control	Calibrated for water temperature from 0 to 250°F (-16 to 121°C). Controls water heater burner to maintain water temperature between 160 and 210°F (71 and 99°C).
5	Load Limit Switch	Controls all electrical power to the water heater. Has overload protection to protect motor, ignition transformer, and electrical controls.
6	Fuel Pressure Gage	Indicates pressure of fuel supplied to the burner. (Normal indication is 100 psi (690kPa)).
7	Fuel Shut Off Valve	Controls fuel flow to burner. 1. Clockwise rotation closes valve. 2. Counterclockwise rotation opens valve.
8	Blower Shutter	Controls amount of air to burner. 1. Turned downward increases air to burner. 2. Turned upward decreases air to burner.
9	Combustion Chamber Sight Glass	Enables operator to visually check combustion in combustion chamber.
10	Burner Assembly Sight Glass	Enables operator to visually check electrodes spark gap to see if they are firing.
11	Motor Contactor Reset	Overcurrent reset devices that break the circuit to each of the blower motor three-phase windings, if motor inputs are overloaded.



BATH UNIT CONTROLS AND INDICATORS

CONTROLS AND INDICATORS (CONT'D)

Key	Control or Indicator	Function
12	Flame Safeguard Control Reset	Lockout switch for flame safeguard control system. When pressed, resets electrical circuit to initiate ignition of flame in water heater combustion chamber.
13	Buzzer	Sounds when Flame Safeguard Control Reset needs resetting.
14	Hour Meter	Indicates cumulative time burner has been in operation to allow maintenance at specific time intervals.
15	Shower Nozzle Control Valve	Controls water flow from shower nozzles.
16	Mixing Valve Temperature Control	Controls mixing valve water outlet temperature.
17	Mixing Valve Outlet Temperature Gage	Indicates temperature of water going to shower stands.
18	Water Pump Motor Switch	Controls power to water pump.
19	Low Water Probe and Relay	Shuts off burner and sounds alarm when water level in heater is below minimum specified level (approximately two gallons).
20	Relief Valve	Valve opens automatically when pressure in water heater exceeds 60 psi to relieve excess pressure.

Section II. OPERATOR'S PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-2. GENERAL

a. Before You Operate the Bath Unit. Always keep in mind the CAUTIONS and WARNINGS. Perform your "before" (B) PMCS.

b. While You Operate. Always keep in mind the CAUTIONS and WARNINGS. Perform your "during" (D) PMCS.

c. After You Operate. Organizational personnel will perform PMCS after (A) operation.

d. If Your Equipment Fails to Operate. Troubleshoot with proper equipment. Report any deficiencies using DA Form 2407, see DA PAM 738-750.

2-3. PMCS PROCEDURES

a. General. The PMCS procedures are contained in table 2-1 below. They are arranged in logical sequence requiring a minimum amount of time and motion on the part of the persons performing them and are arranged so that there will be mimimum interference between persons performing checks simultaneously.

b. Item Number Column. Checks and services are numbered in chronological order regardless of interval. This column is used as a source of item numbers for the "TM Number" column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, in recording results of PMCS.

c. Interval Columns. The columns headed "B", "D", and "A" contain a dot (●) opposite the appropriate check. Thus, if a given check is performed before operation, a dot is placed opposite the checks in the "B" column, if the check is made after operation, the dot is placed in the column headed "A", and if the same check is made in two or more periods, a dot is placed in each applicable column.

d. Item To Be Inspected Column. The items to be inspected are identified by a few words, usually the common name.

e. Procedures Column. This column contains a brief description of the procedure by which the check is to be performed. It contains all the information required to accomplish the checks and services, including appropriate tolerances, adjustment limits, and instrument and gage readings.

f. Equipment Is Not Ready/Available If Column. This column contains the criteria which will cause the equipment to be classified as not ready or not available because of inability to perform its primary mission.

g. Perform weekly as well as before operations if you are the assigned operator and have not operated the item since the last weekly or if you are operating the item for the first time. See paragraph 3.5.2.2c, MIL-M-63036.

h. Leakage definitions for operator/crew PMCS shall be classified as follows:

Class 1	Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.
Class 11	Leakage of fluid great enough to form drops but not enough to cause drops to drip from the item being checked/inspected.
Class 111	Leakage of fluid great enough to form drops that fall from the item being checked/inspected.

CAUTION

- Equipment operation is allowable with minor leakages (Class 1 or 11). Of course, you must consider the fluid capacity in the item/system being checked/inspected. When in doubt, notify your supervisor.
- When operating with Class 1 or Class 11 leaks, continue to check fluid levels as required in your PMCS.
- Class 111 leaks should be reported to your supervisor or organizational maintenance.

Table 2-1. Operator Preventive Maintenance Checks and Services

B-Before Operation D-During Operation A-After Operation

Item	INTERVAL			ITEM TO BE INSPECTED	Equipment Is Not Ready/Available If:
No.	B	D	A	PROCEDURE	
				BATH UNIT	
				MISCELLANEOUS ASSEMBLIES	
1	●			Power Cable Assembly Check for broken insulation and loose or damaged connectors.	Defective power cable
	●	●		Suction Strainer Assembly Check strainer at point of water intake. Clear any obstructions. Be sure that strainer is positioned away from debris and sediment.	Clogged or damaged strainer
	●	●	●	Water Hose Assemblies Check hoses and connections for cracks, leaks, or collapsed lines.	Leaky or damaged hoses or connections
	●	●	●	Smoke Stack and Guard Assembly 1. Check for tight connections, breaks, leaks, or foreign material lodged in pipes.	Defective or damaged exhaust system
		●		2. Check exhaust gases for light heat haze. If haze is present, depress spring-loader rivet on blower shutter and adjust shutter up or down until exhaust gas is clear.	Maladjusted blower shutter
2	●	●		Shower Stand Assembly 1. Check for defective shower heads and couplings.	Damaged or clogged shower heads or leaky connections
	●			2. Check for clogged nozzles.	
3	●	●		Water Heater Assembly 1. Check fuel supply control assembly for leaks or incorrect fuel supply and return line connections.	Fuel supply and return lines reversed or damaged connections
	●		●	2. Check ignition cable for frayed insulation or damaged connections.	Defective ignition cable

Table 2-1. Operator Preventive Maintenance Checks and Services (Cont'd)

B-Before Operation D-During Operation A-After Operation

Item No.	INTERVAL B	INTERVAL D	INTERVAL A	ITEM TO BE INSPECTED PROCEDURE	Equipment Is Not Ready/ Available If:
				BATH UNIT (Continued)	
	●		●	3. Check blower and water assembly for tight mounting.	Loose or broken mounting hardware
	●			4. Check fuel pump assembly for full prime.	
	●		●	5. Check air shutter assembly for binding, slippage, or damage.	Defective air shutter
	●			6. Check load limit switches to be sure they are not tripped from overload conditions.	

Section III. OPERATION UNDER USUAL CONDITIONS

2-4. GENERAL

This section tells you how to assemble and prepare the Bath Unit for use, make initial adjustments and checks, operate the Bath Unit, and prepare the Bath Unit for movement.

2-5. SELECTING A SITE TO SETUP BATH UNIT

WARNING

Do not connect water heater to untested water supply. Contaminated water can cause illness or death.

NOTE

Without a pasteurization kit, the water source must be approved by the unit surgeon. See safety precautions on inside cover page.

Select a site beside a stream. Locate the Bath Unit so that drainage from the shower area is carried downstream or downhill from the suction hose strainer to prevent waste water from being drawn back into water source. If this arrangement is not possible, dig a ditch or build a dike around the shower stands to allow waste water to drain away from the water source. If a pressurized water source is to be used, discharge the water into an open reservoir before it is drawn into the bath system to prevent straining the water pump unduly.

2-6. UNPACKING THE BATH UNIT

Upon receipt, the Bath Unit may be packaged in wooden containers or commercial packaging materials. If the unit is wrapped commercially, unpack equipment carefully. Make sure all items are accounted for before discarding wrapping materials. If the Bath Unit is packaged in two wooden containers, uncrating procedures are required. The bottom of the wooden containers are constructed to form a skid that can be used to slide the Bath Unit for short distances. This skid also allows handing of the Bath Unit by slings or forklift truck. Use care when attaching slings to the container. Make sure the container balances evenly and slings are correctly positioned before lifting to uncrating site.

CAUTION

Handle reusable containers carefully to prevent damage.

2-6. UNPACKING THE BATH UNIT (CONT'D)

a. Unlatch lid (1) and remove from base (2).

b. Unbuckle strap (3) and lift smoke stack (4) out of container.

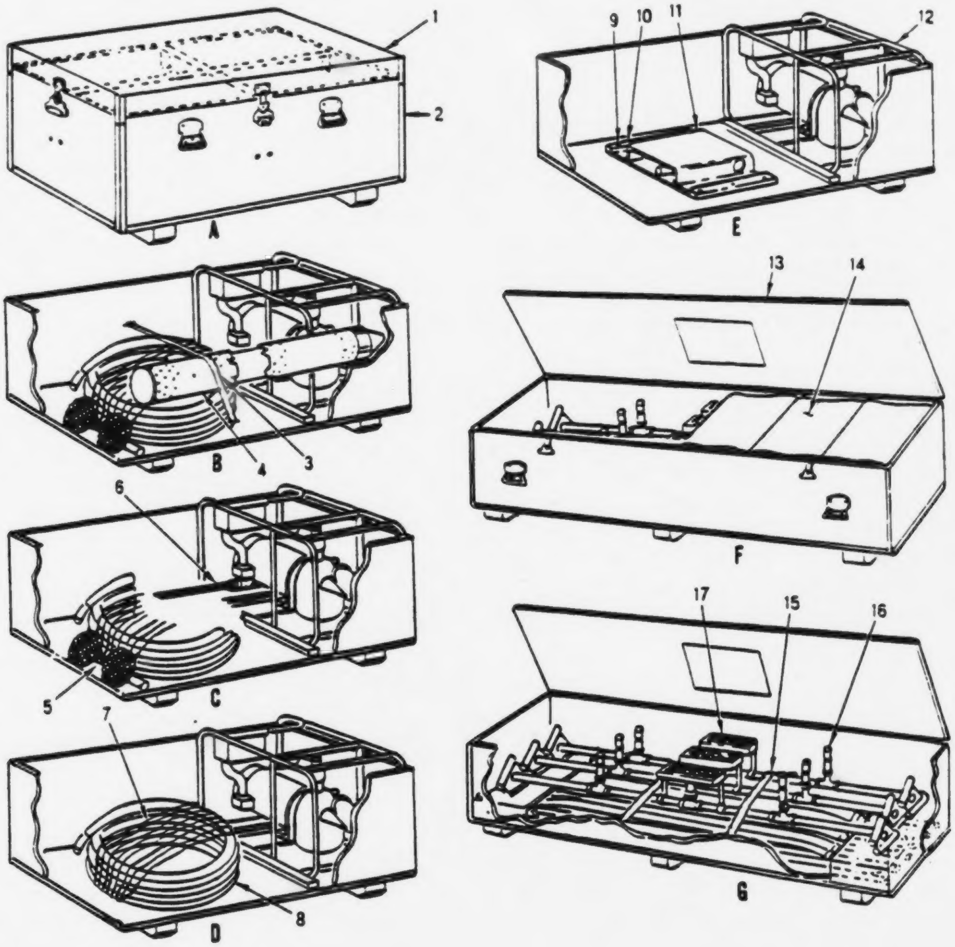
c. Remove water strainer (5) and fill vent assembly (6) by lifting out.

d. Remove electrical cable assemblies (7) and hose assemblies (8).

e. Loosen three screws (9) securing support brace (10) and lift mixing valve (11) out. Lift water pump (12) out.

f. Unlatch and open lid (13) on container No. 2. Remove three wind screens (14).

g. Unbuckle two straps (15) and remove shower head assemblies (16) with attached soap tray (17).



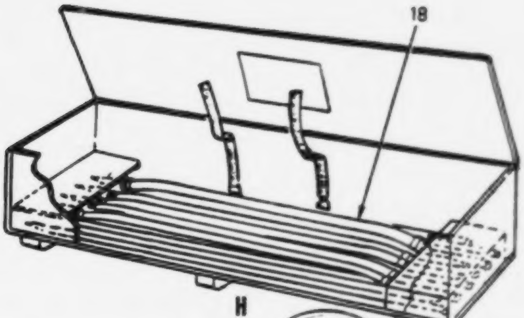
2-6. UNPACKING THE BATH UNIT (CONT'D)

h. Remove 1 inch hoses and 1 1/2 inch hose (18) from under shelf.

i. Remove twelve shower head legs (19) from bottom of container.

j. Visually check for damage.

k. Disconnect fuel return hose (20) and fuel suction hose (21) from holder.



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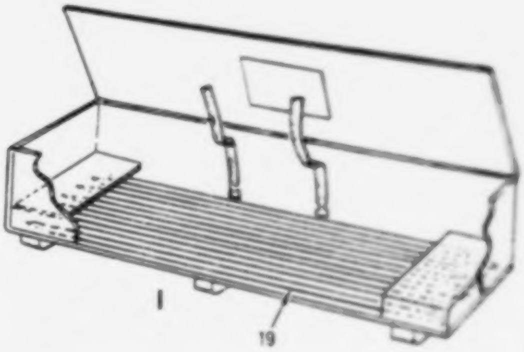

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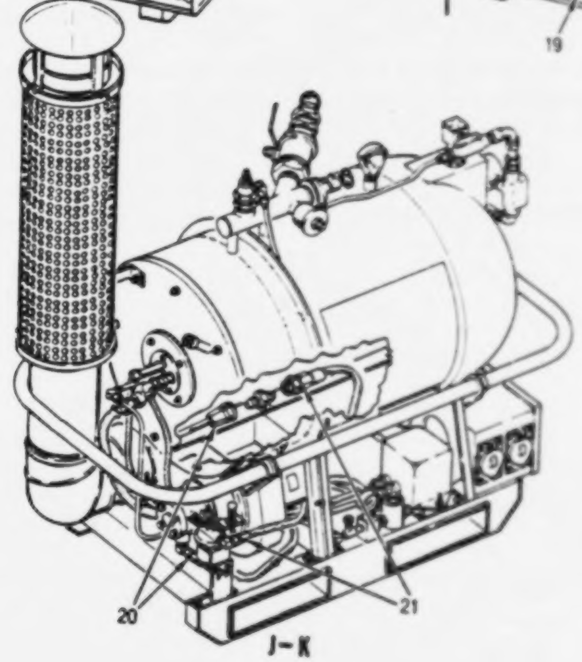


J-K

2-7. SETTING UP BATH UNIT

Use the following procedures to set up the Bath Unit.

CAUTION

> To prevent equipment damage, be sure that hose couplings are free of dirt or foreign matter and that coupling gaskets are in place before coupling hoses.

a. Connect suction hose strainer (1) to male end of 25-foot 1-inch water hose (2) and secure coupling locking levers (3).

b. Connect female end of water hose (4) to water pump suction port (5).

c. Place water pump (6) on level surface approximately 20 feet from water source. Be sure suction lift does not exceed 15 feet.

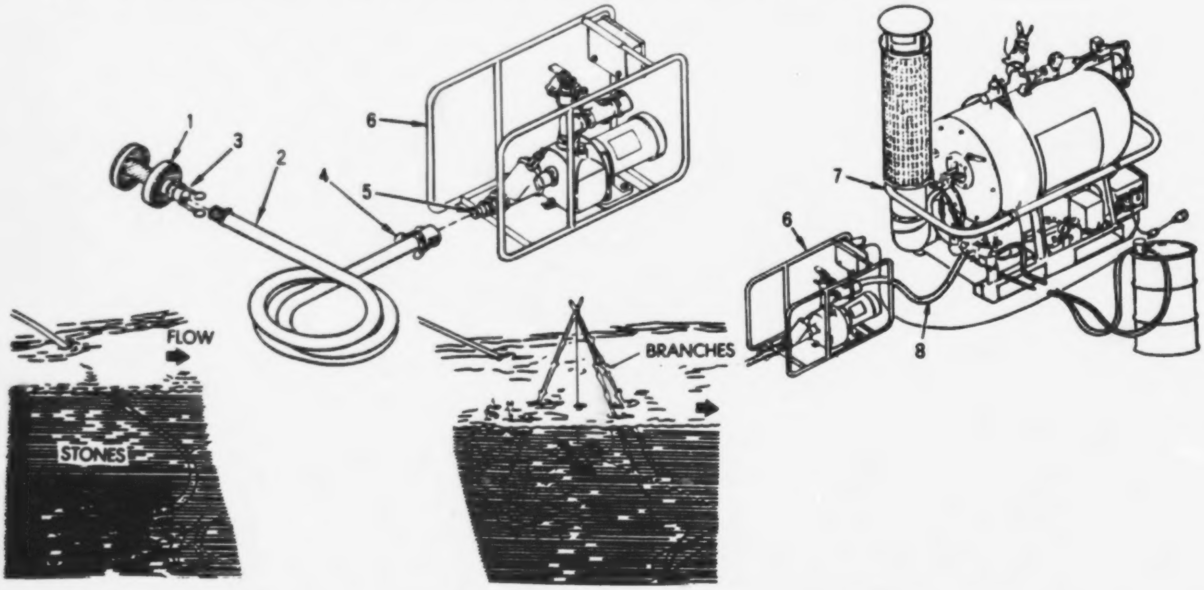
d. Place suction hose assembly and strainer into water source using one of two methods:

(1) Place strainer (1) on mound of stones or gravel and make large pile of stones upstream from strainer to divert debris from strainer.

(2) Build a tripod using tree branches and suspend strainer from tripod. Build a barrier using tree branches upstream from strainer to prevent leaves, weeds or other debris from entering the strainer.

e. Place water heater (7) on level ground approximately 5 feet from water pump (6). If possible arrange suitable shelter or wind break for water heater (7) to conserve fuel.

f. Connect male coupling of 1 1/2 inch water hose (8) to water pump (6) and connect female end of hose to water heater (7) intake.



2-7. SETTING UP BATH UNIT (CONT'D)

g. Connect female end of 7 1/2 foot 1 inch water hose (9) to water heater (7) and male end of hose to HOT fitting (10) on mixing valve (11).

h. Connect male end of 7 1/2 foot 1 inch hose (9) to water pump outlet (12) and female end of hose to COLD fitting (13) of mixing valve (11).

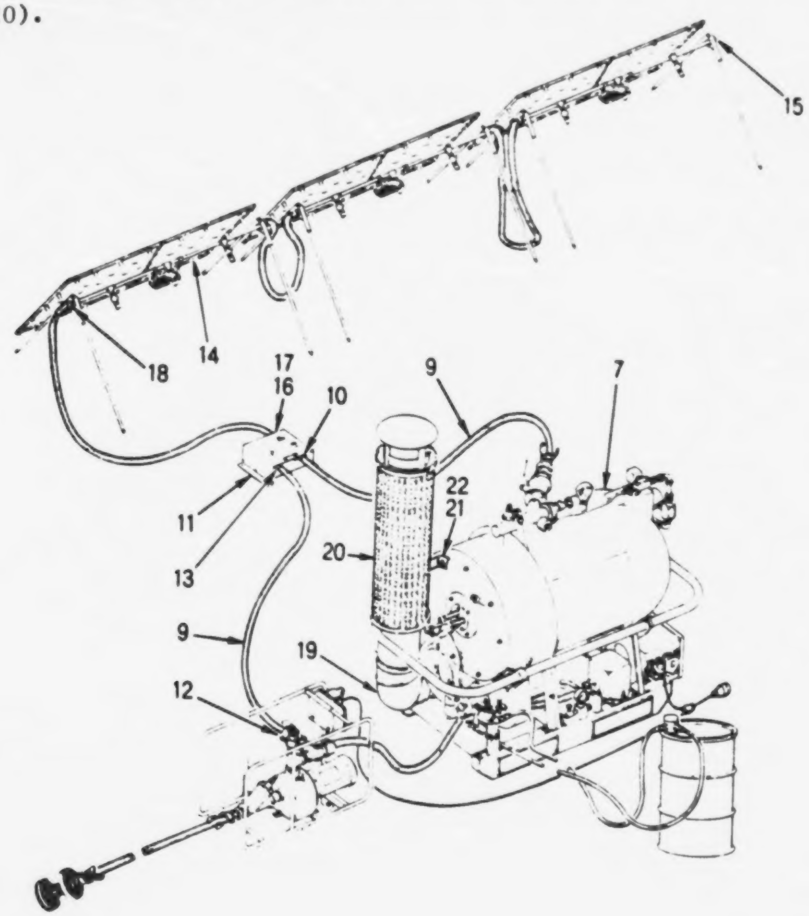
i. Erect shower stand (14) approximately 20 feet from mixing valve (11). Connect sections of shower stand assembly using 7 1/2 foot 1 inch water hose (9). Install cap (15) on shower stand end connector.

j. Connect female end of 25 foot 1 inch water hose (16) to MIXED fitting (17) of mixing valve (11). Connect male end of hose to female fitting (18) of shower stand (14).

k. Install elbow (19) on water heater (7) with a slight turn to right to seat pin in slot.

l. Insert smoke stack and guard assembly (20) through bracket (21) onto elbow (19).

m. Tighten screw (22) on bracket (21) to secure smoke stack and guard assembly (20).



2-7. SETTING UP BATH UNIT (CONT'D)

n. Place fuel container (23) approximately five feet from water heater (7).

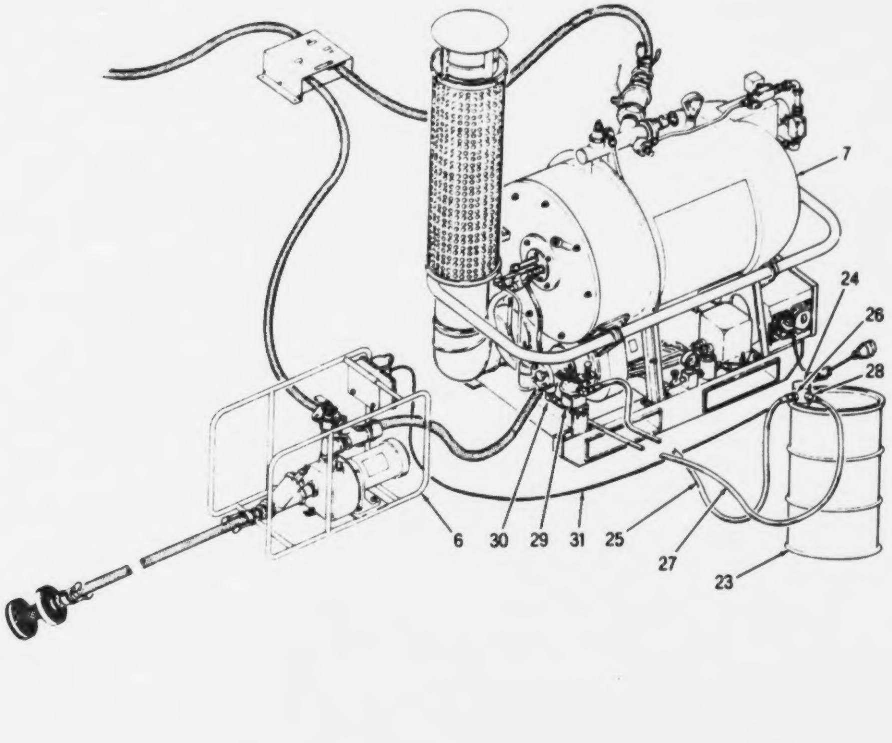
WARNING

Fuel used with the Bath Unit is highly flammable and may be dangerous to human life if handled improperly. Tighten all fuel fittings firmly with a wrench to prevent leaks. Recheck all fittings when the water heater is operating to ensure no fuel leaks with the system under pressure.

o. Screw drum fill adapter (24) into fuel container.

p. Connect fuel line (25) from pump filter (29) to suction fitting (26) on drum fill adapter assembly (24).

q. Connect fuel line (27) from pump (30) to return fitting (28).



r. Connect cable assembly (31) to water heater (7), water pump (6) and to power source.

WARNING

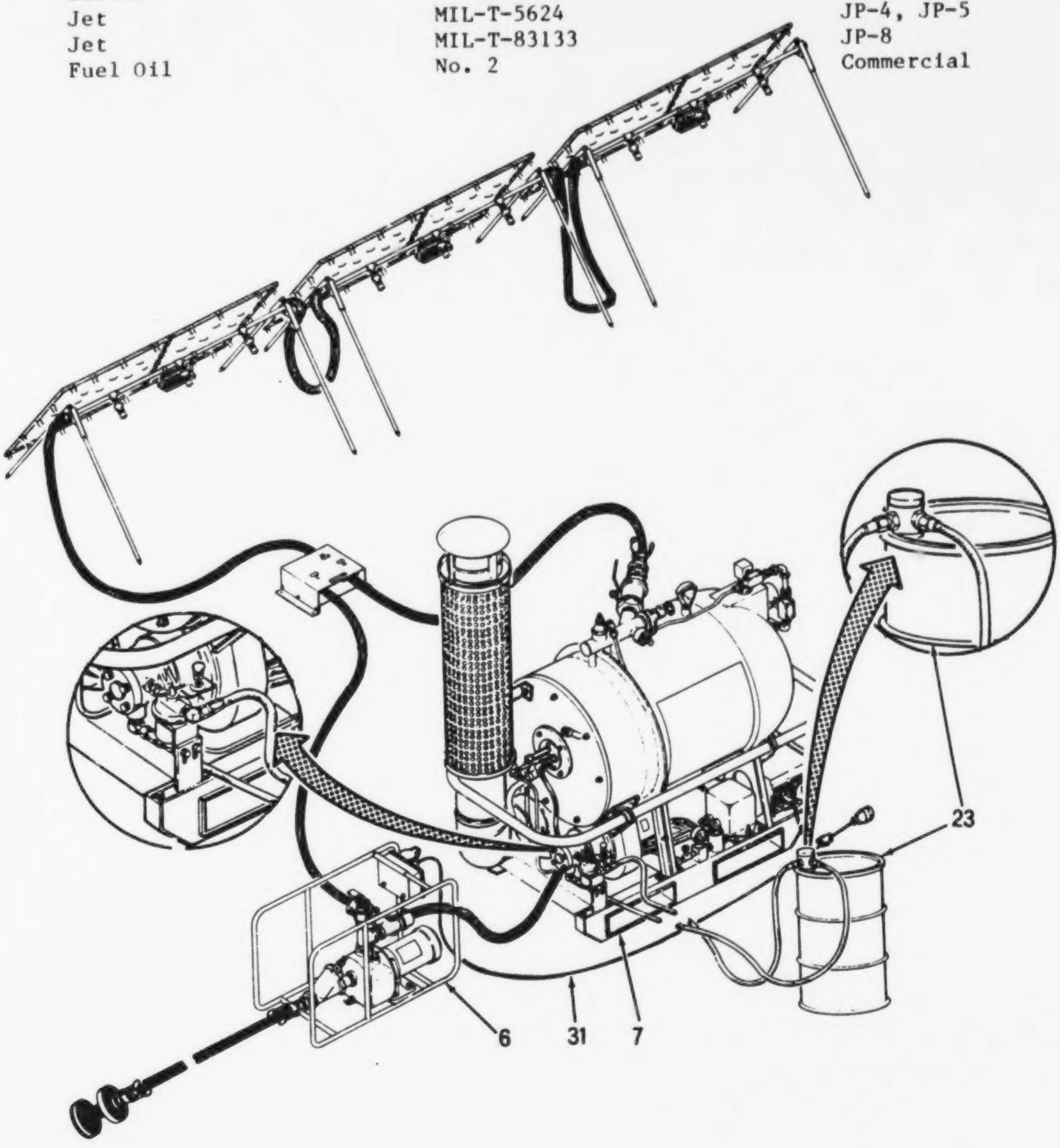
Use only specified fuel. Failure to do so may result in injury to personnel or equipment.

CAUTION

Lack of lubrication may cause pump damage when straight gasoline is used as fuel. To avoid failure, 1 quart of oil must be mixed with each 5 gallons of gasoline used. (See paragraph 3-1.)

s. Fill fuel container (23) with approved fuel as follows:

MOGAS	MIL-G-3056	All Grades
AVGAS	MIL-G-5572	All Grades
Diesel	VV-F-800	DF-A, DF-1, DF-2
Jet	MIL-T-5624	JP-4, JP-5
Jet	MIL-T-83133	JP-8
Fuel Oil	No. 2	Commercial

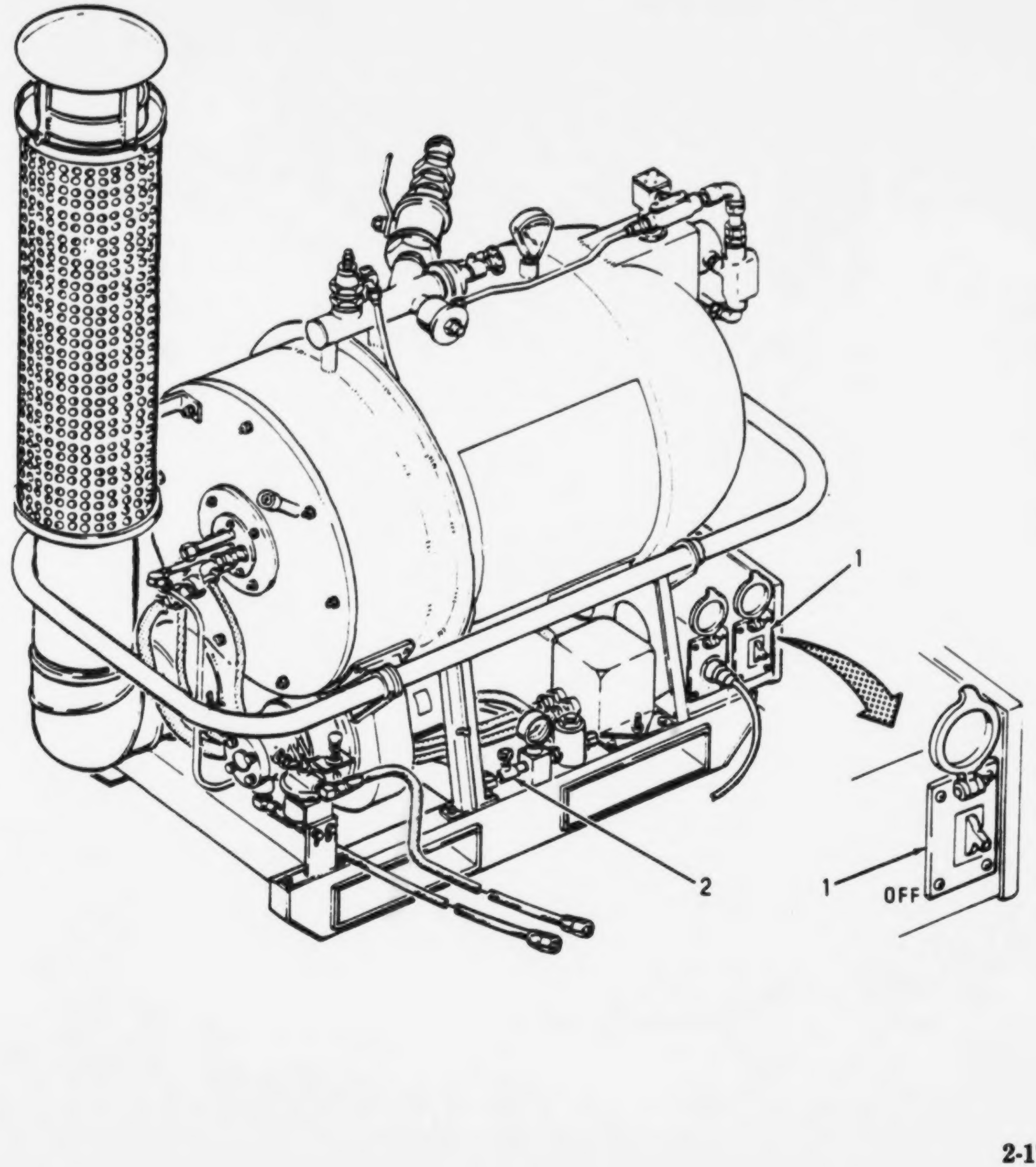


2-8. PREPARATION FOR USE

Before you start the Bath Unit, go to Section II, Operator's Preventive Maintenance Checks and Services (PMCS) and do the "Before Operation" checks in the table and then proceed as follows:

a. Make certain water heater load limit switch (1) is turned to OFF.

b. Make sure that manual fuel valve (2) is closed.

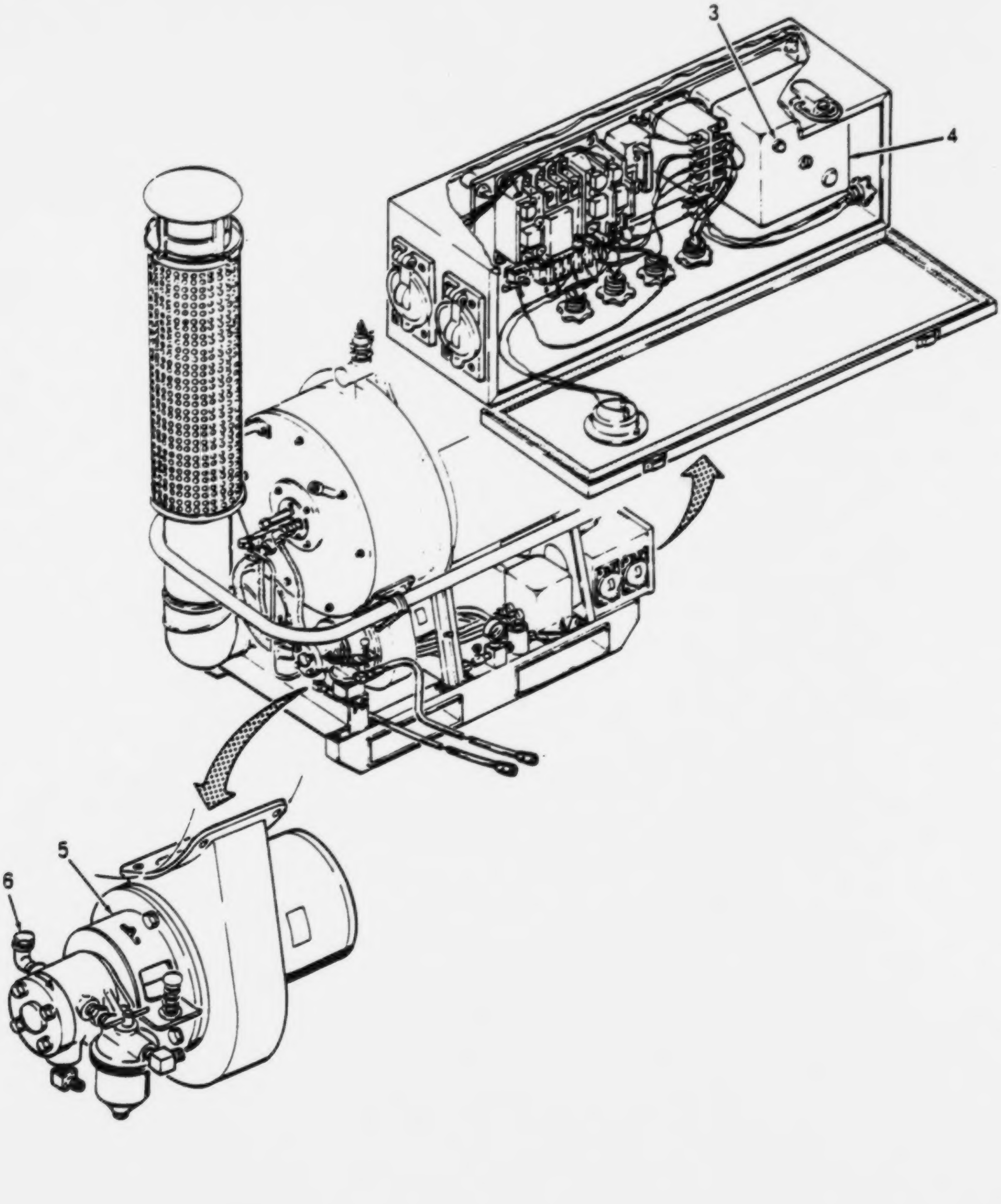


2-8. PREPARATION FOR USE (CONT'D)

c. Press reset button (3) to ensure that flame safeguard control (4) is not locked out.

d. Open blower shutter (5) approximately half way.

e. Open fuel pump primer plug (6) and fill fuel pump with fuel. Replace plug.



2-8. PREPARATION FOR USE (CONT'D)

f. Make sure that one end of hose (7) is connected to supply fitting (8) of fuel filter (9) and to fitting (10) on vent (11). Connect return fuel line (12) to drum fill adapter (11).

WARNING

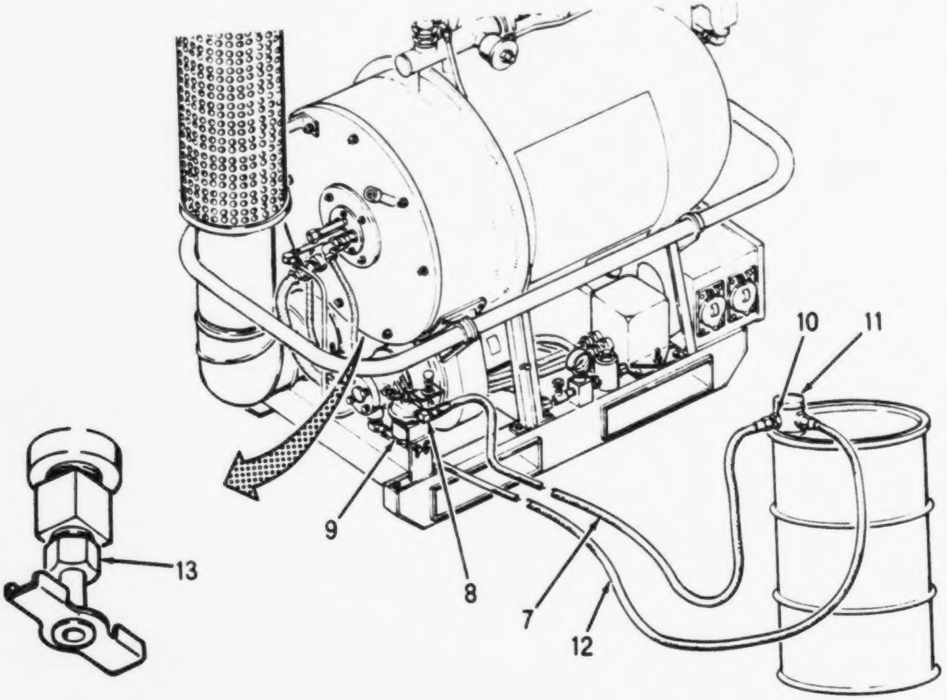
Exposed fuel and fuel vapor can ignite or explode resulting in possible serious injury and even death. Observe proper safety precautions when servicing the fuel system. Ensure that the water heater is cold before servicing the burner.

NOTE

The operator must periodically monitor the level of the fuel supply. The fuel container should be kept as full as possible to reduce water condensation. The frequency of refueling is dependent on the size of the fuel container. Excessive water in the fuel supply will decrease heater efficiency and corrode both the chamber and the burner.

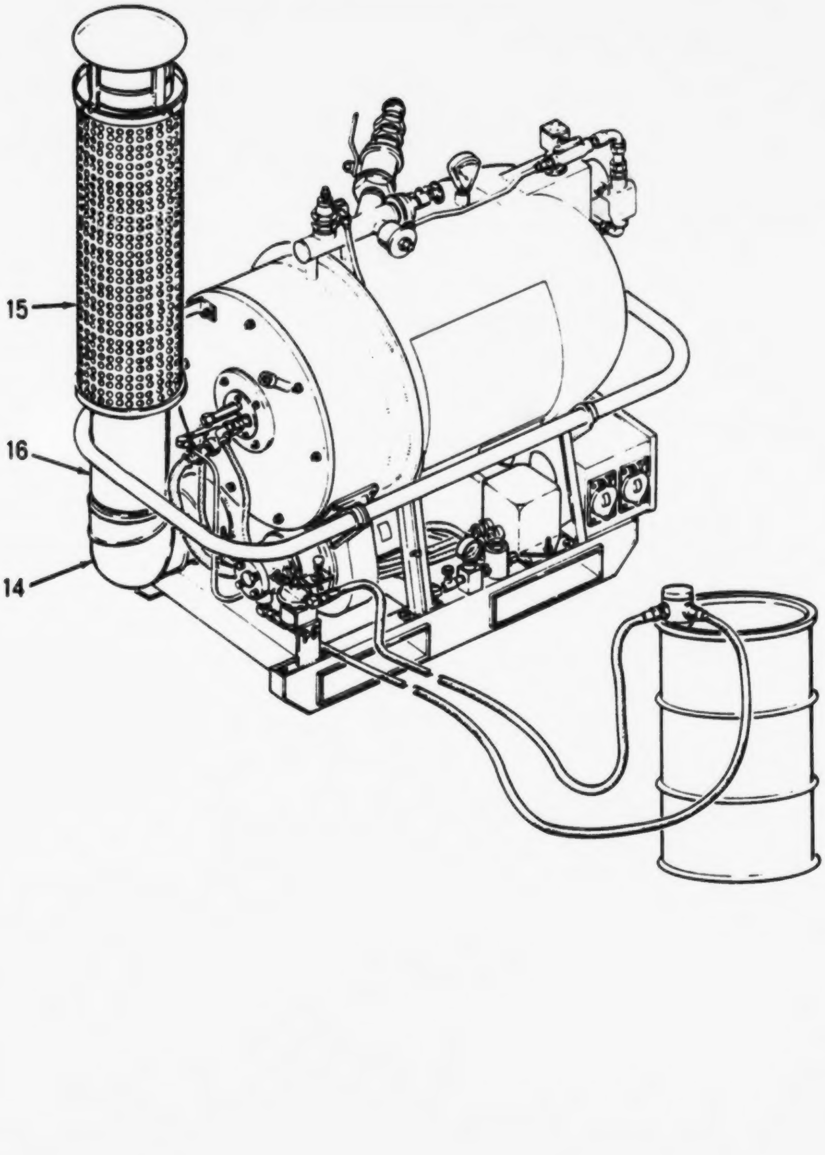
g. Check to see that all water lines are connected.

h. Be certain that water heater drain cock (13) is closed.



2-8. PREPARATION FOR USE (CONT'D)

i. Check to be sure that smoke pipe elbow (14), the two lengths of smoke pipe guard assembly (15) and smoke pipe (16) are securely installed.



2-9. START-UP PROCEDURES

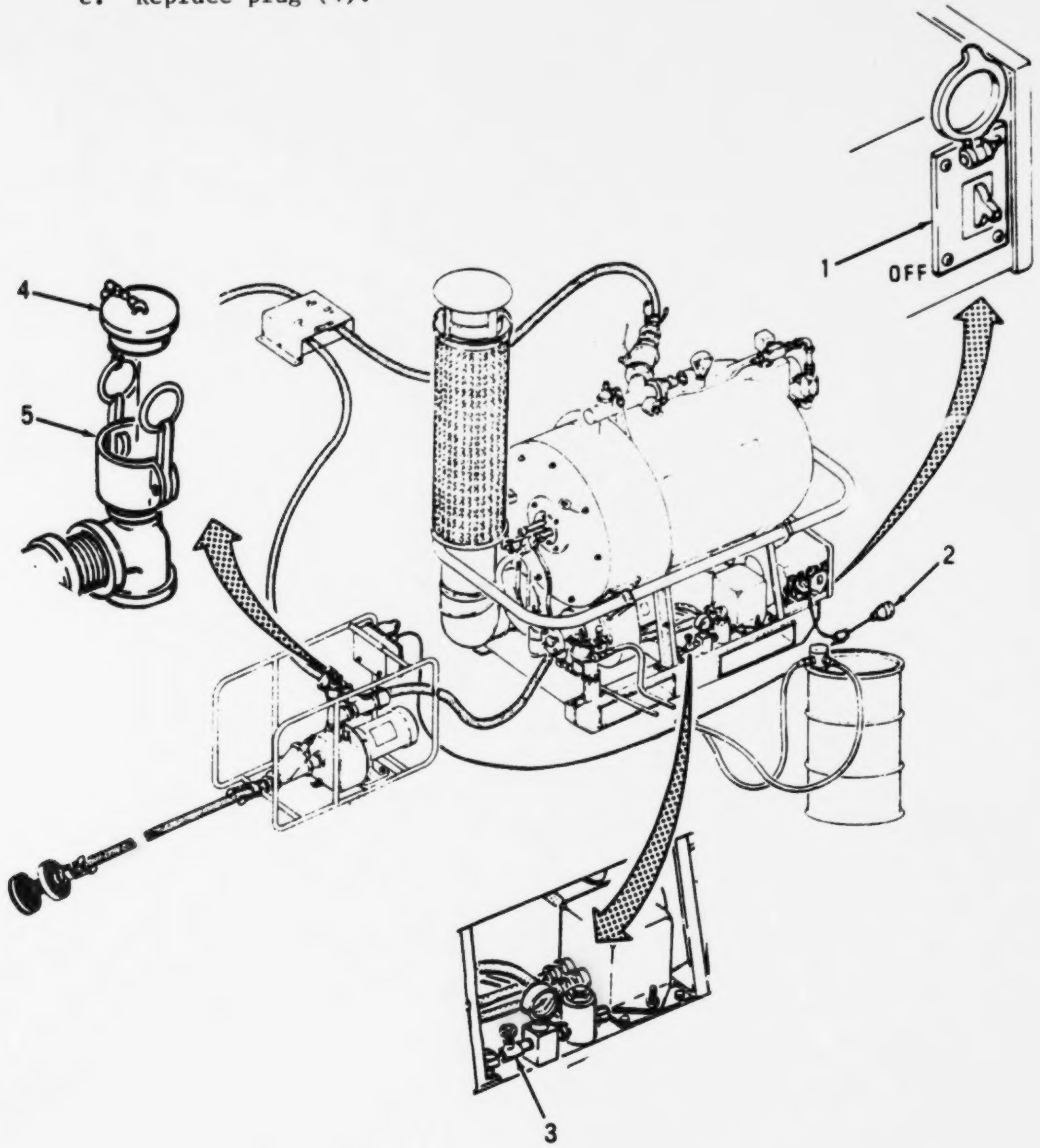
a. Perform all procedures in paragraph 2-8.

b. Turn off load limit switch (1) and connect power cable (2) to power source.

c. Close fuel valve (3) by turning to right.

d. Remove plug (4) and fill coupling (5) with water.

e. Replace plug (4).

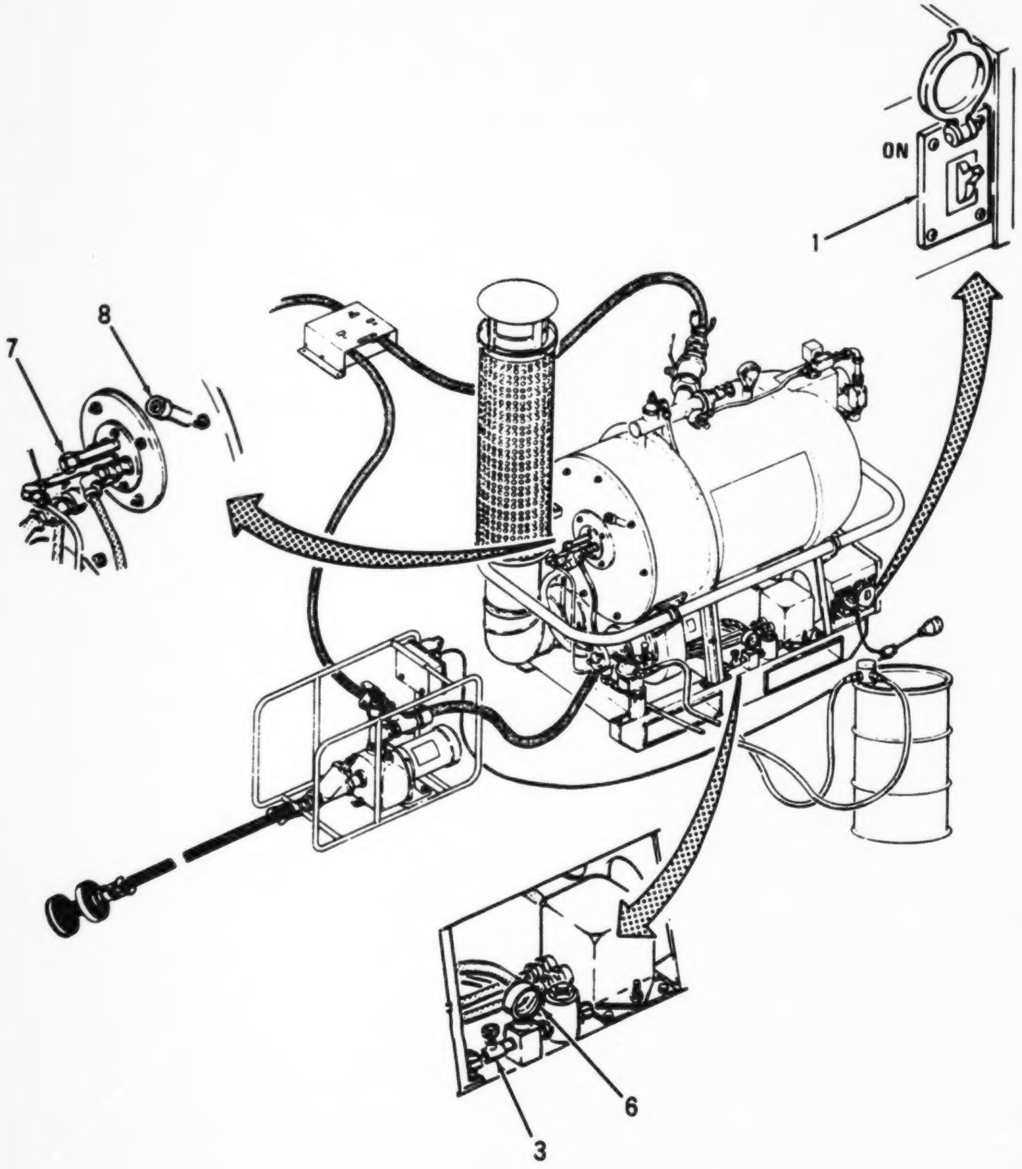


2-9. START-UP PROCEDURES (CONT'D)

f. Open fuel valve (3) and turn load limit switch (1) and power source on. Fuel pressure gage (6) should show 100 psi (690kPa).

g. View ignition spark through sight tube (7) after power turn on.

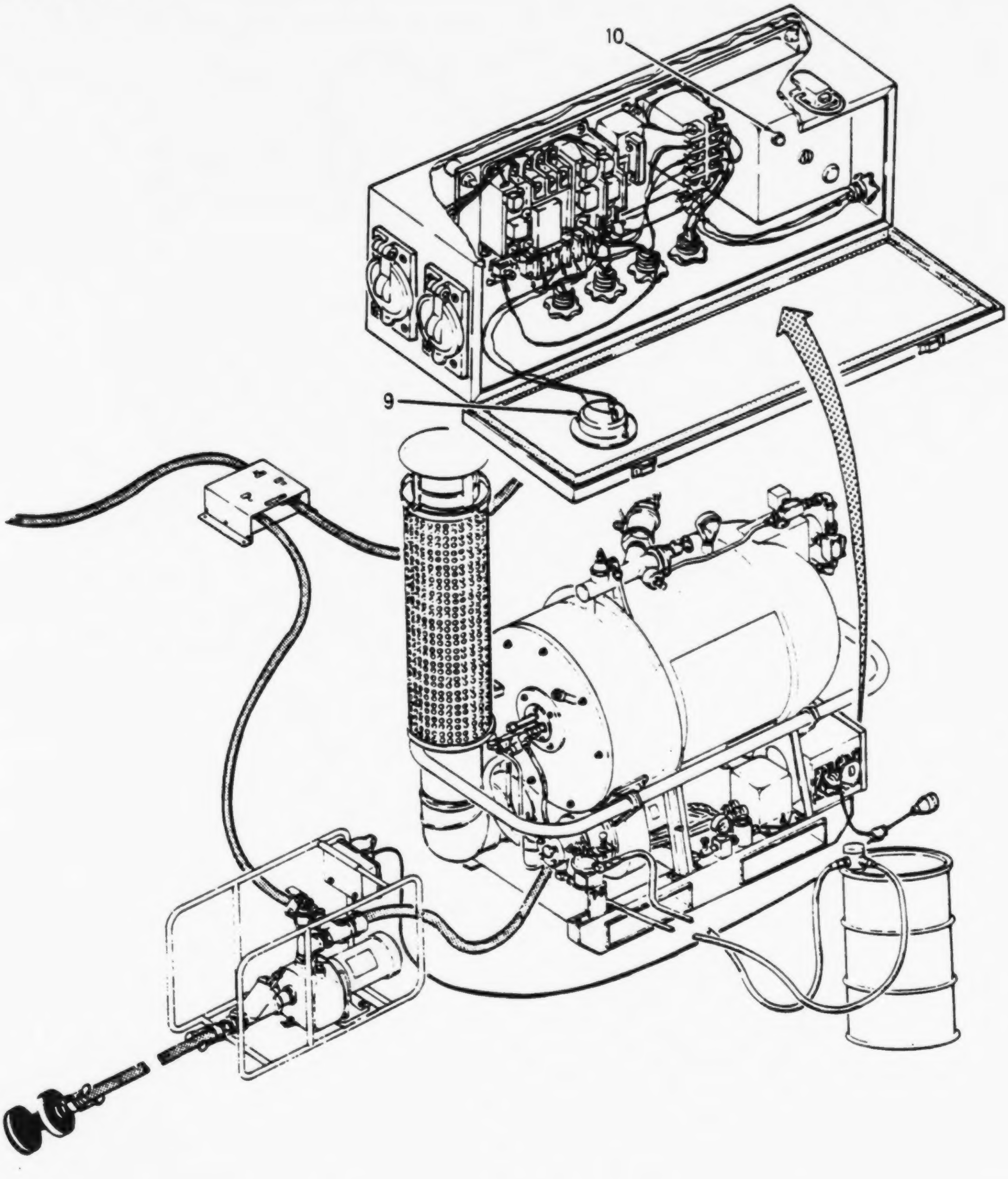
h. Wait seven seconds and view combustion through sight tube (8).



2-9. START-UP PROCEDURES (CONT'D)

i. If combustion does not occur after an additional 12 second wait, buzzer (9) sounds and ignition spark shuts down.

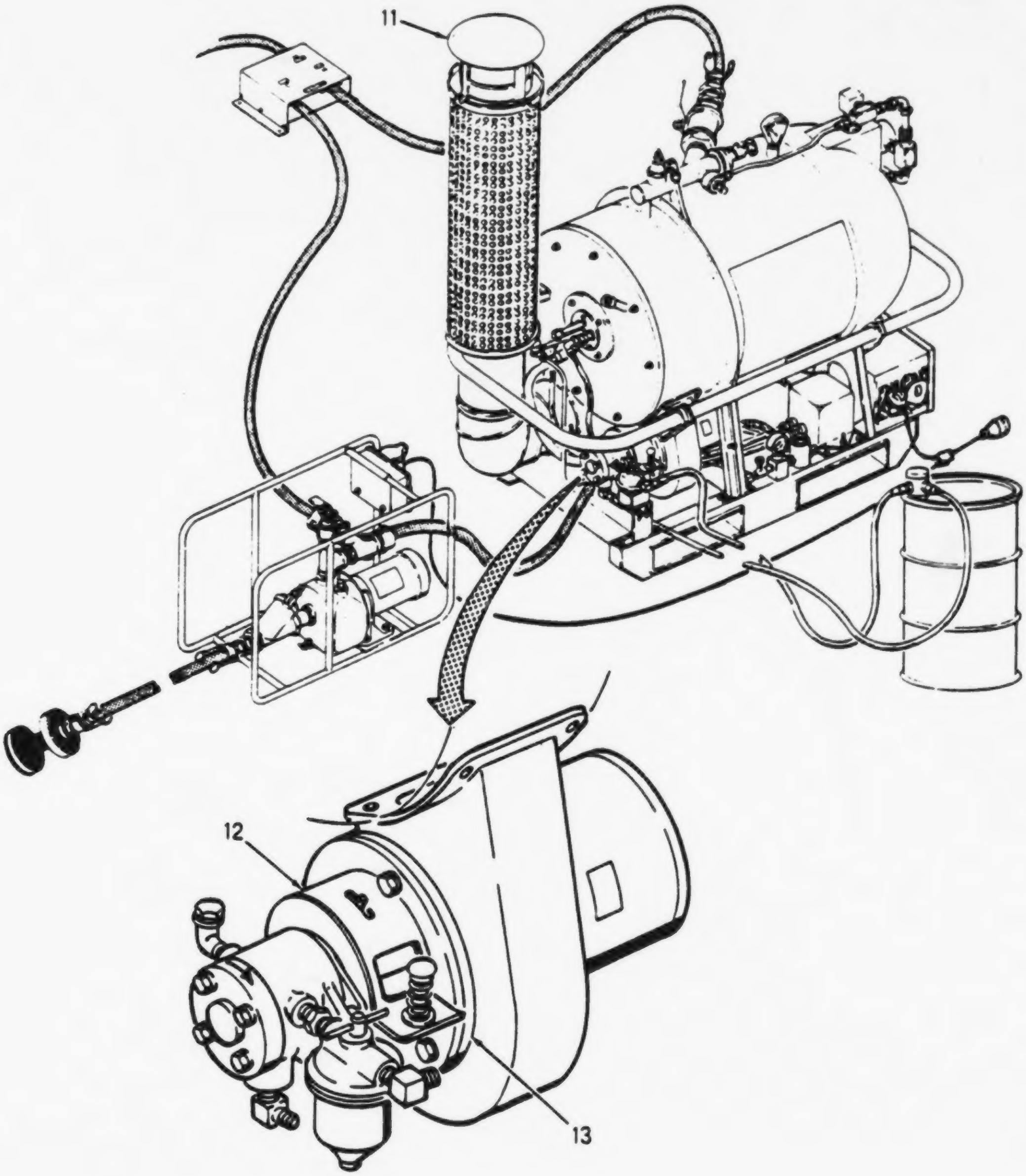
j. Wait two minutes after buzzer sounds and press safety reset button (10). If combustion still does not occur, troubleshoot in accordance with paragraph 3-3.



2-9. START-UP PROCEDURES (CONT'D)

k. After start-up, exhaust gasses from exhaust stack (11) should be transparent and smokeless. If smoke is present, slowly open air band (12) on blower assembly (13) until exhaust gasses are transparent and smokeless. (See step 1, below.)

The water heater is now in automatic operation.



2-9. START-UP PROCEDURES (CONT'D)

NOTE

Varying the air band position adjusts the ratio of air to fuel. Normal vibration of the water heater may change the air band adjustment. Check frequently for the presence of smoke.

1. If smoke is visible, adjust air band as follows:

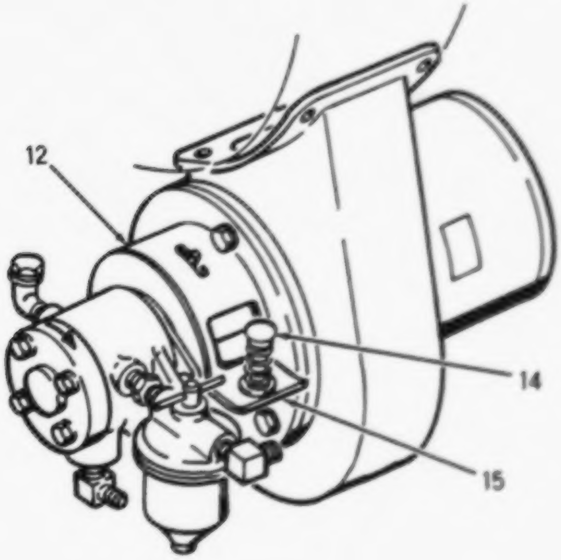
   (1) Press rivet (14) on air band (12).

   (2) Shift air band adjustment tabs (15) downward while observing smoke.

   (3) Open air band (12) until smoke is no longer visible.

NOTE

Open air band only as wide as needed to stop visible smoke. Do not open air band wider than needed. This prevents dirt from entering system and corrosion and carbon buildup.



2-10. OPERATING PROCEDURES.

Perform the start up procedures (paragraph 2-9) to ensure that the equipment is in good working condition. Perform the following procedures for normal operation.

a. Turn off water heater outlet valve (1).

b. Turn on fuel valve (2).

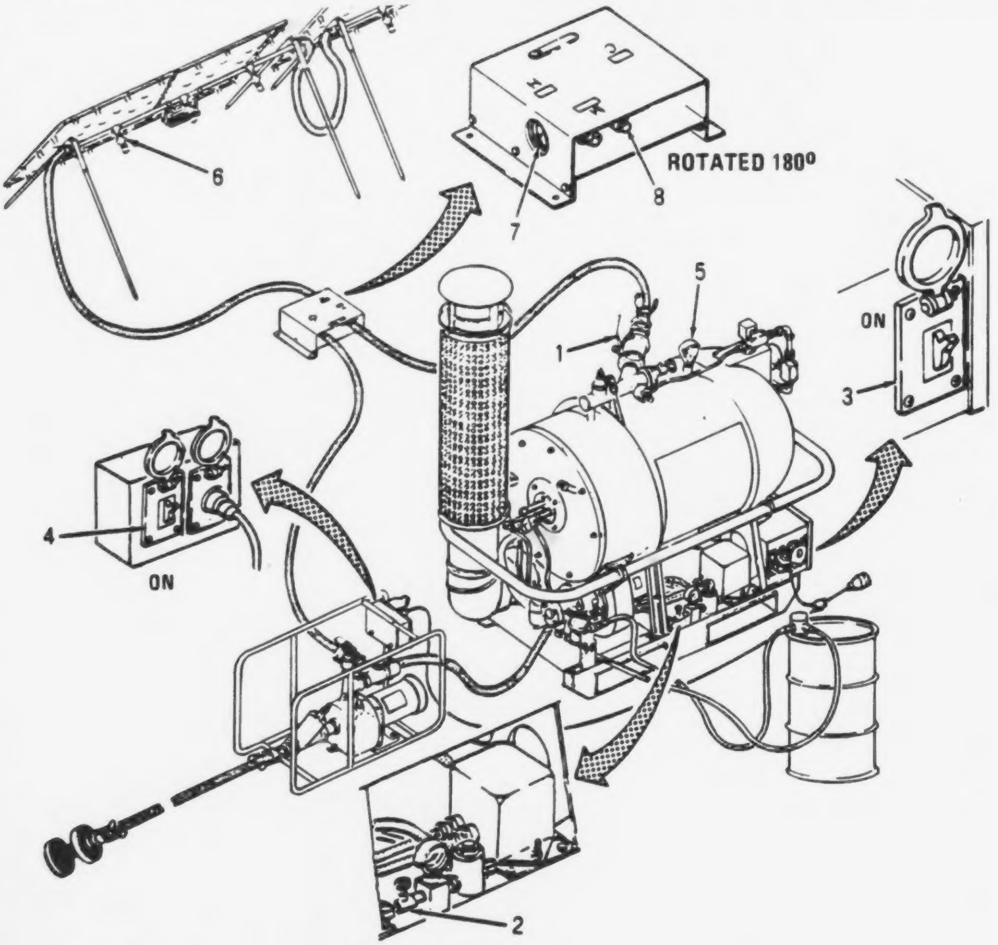
c. Turn on load limit switch (3).

d. Turn on water pump (4).

e. Wait until water temperature gage (5) shows 160°F (71°C) and turn on water heater outlet valve (1).

f. Turn on shower nozzle (6).

g. Observe mixing valve outlet temperature gage (7). If water temperature is incorrect, adjust water temperature control (8) to desired water temperature.



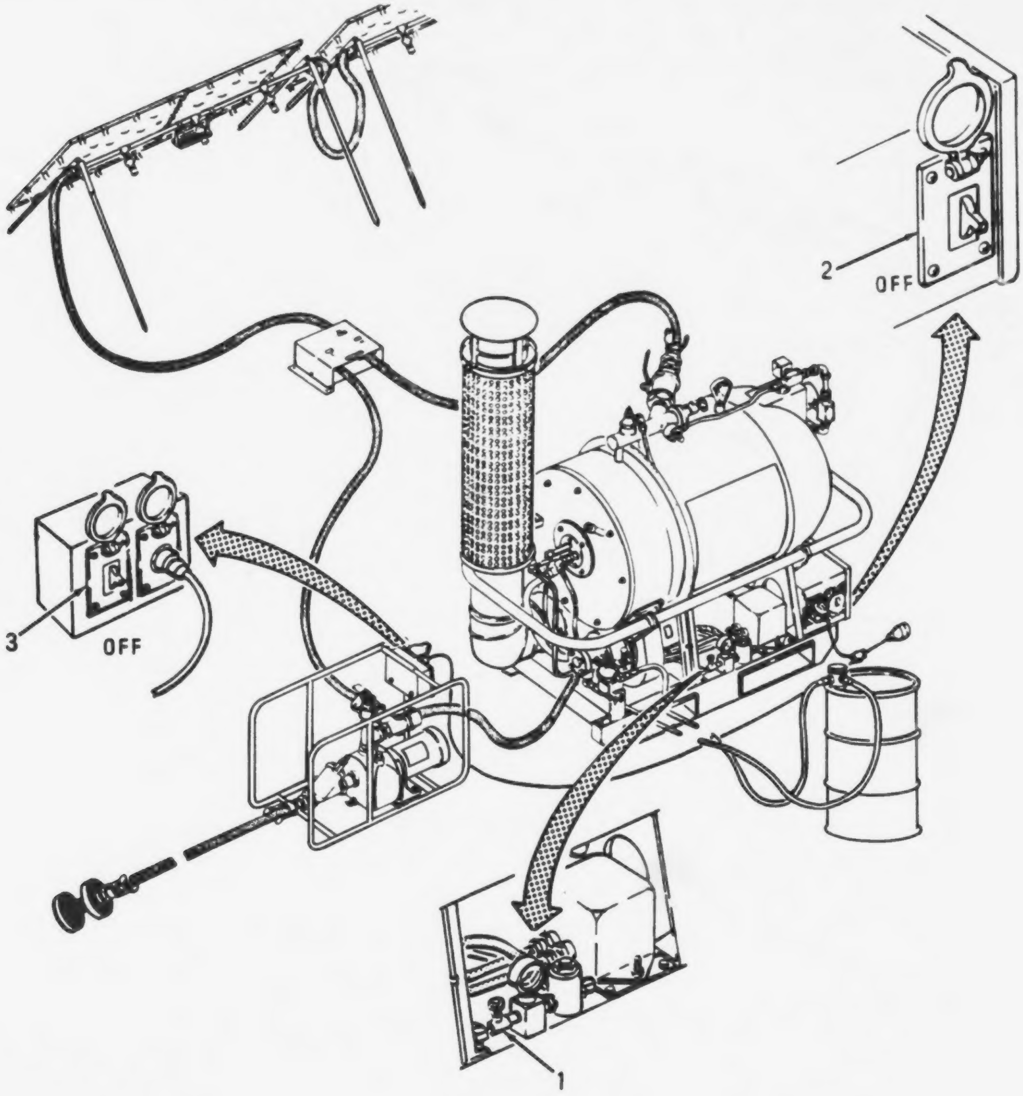
2-11. SHUTDOWN PROCEDURES

Perfrom the shutdown procedures after normal use or when the equipment will not be used for an extended period.

a. Turn off fuel valve (1).

b. Turn off load limit switch (2).

c. Turn off water pump (3).



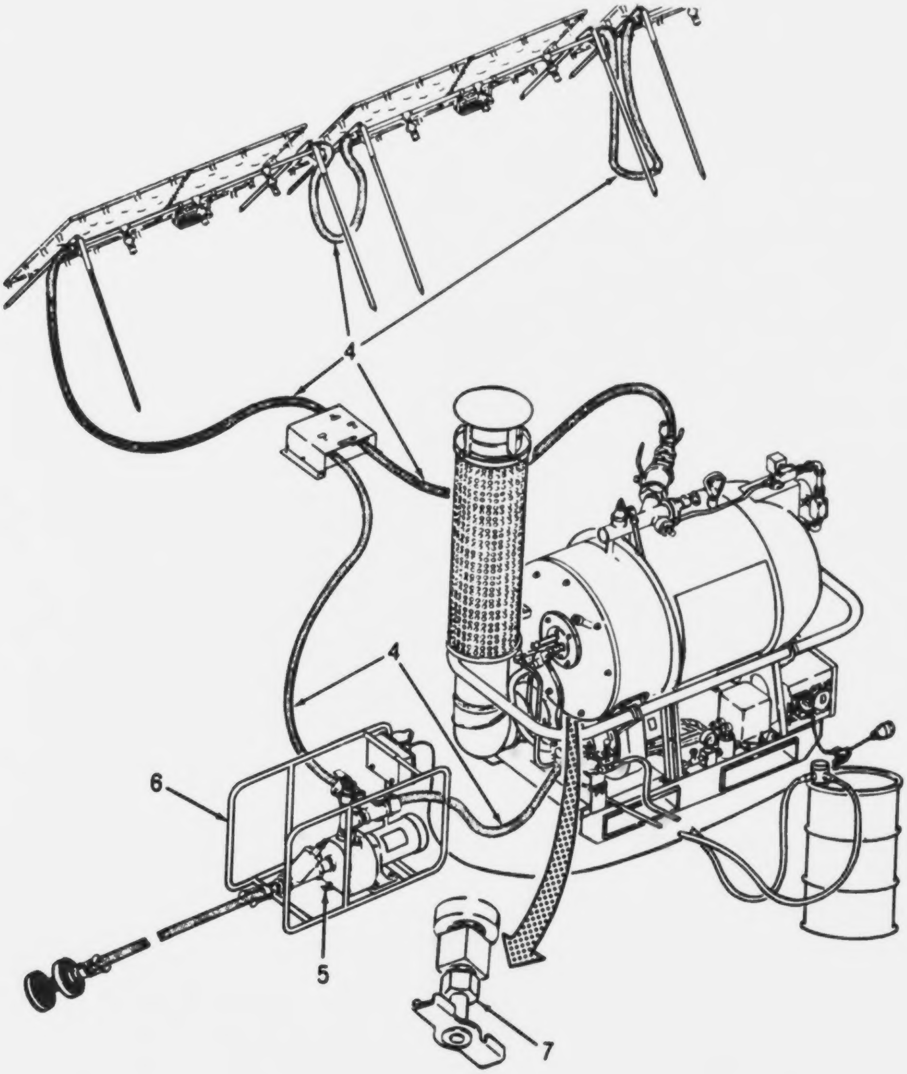
2-11. SHUTDOWN PROCEDURES (CONT'D)

If there is a danger of the Bath Unit freezing, perform the following procedures.

d. Disconnect and drain all water hoses (4).

e. Open drain cock (5) on the water pump (6) by turning to left and tilt water pump on end to let water drain out.

f. Reach under water heater and open drain cock (7) by turning to left.



2-11. SHUTDOWN PROCEDURES (CONT'D)

If the Bath Unit will not be used for five days or more, perform the following procedures.

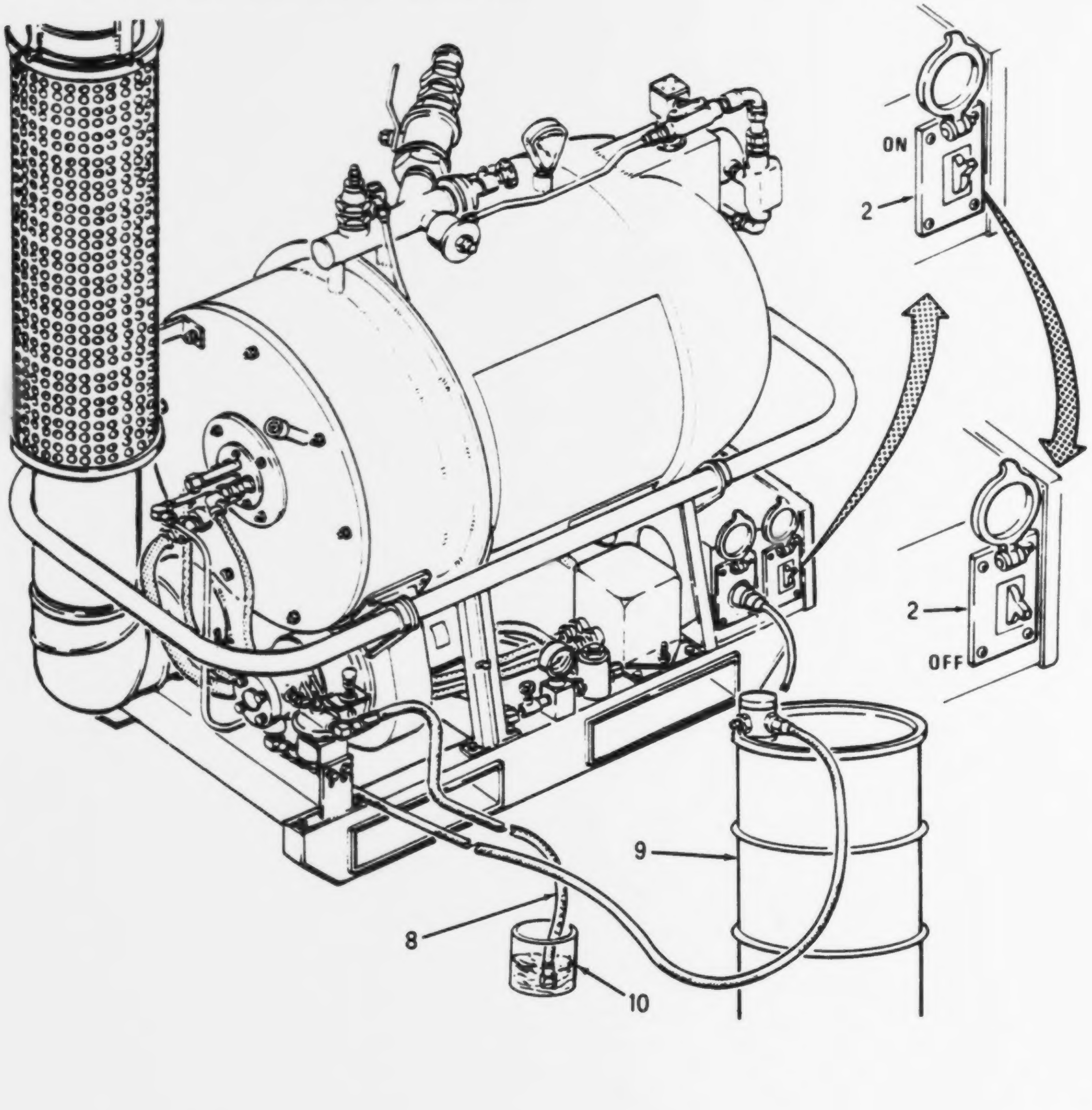
g. Remove fuel feed hose (8) from fuel container (9).

h. Place end of hose (8) into quart container (10).

i. Fill container (10) with diesel fuel.

j. Turn on load limit switch (2) and allow unit to operate until quart container (10) is almost empty. Turn off water heater fuel shut off valve and let system operate until flame extinguishes.

k. Turn off load limit switch (2).



2-12. DISMANTLING BATH UNIT FOR MOVEMENT.

These procedures provide instructions for dismantling the Bath Unit and stowing it for movement. Perform shutdown procedures in paragraph 2-11.

WARNING

> Do not attempt to move the Bath Unit before disconnecting all electrical power from the unit.

a. Disconnect power cable (1) from water heater (2) and from water pump (3).

b. Disconnect strainer (4) from water hose.

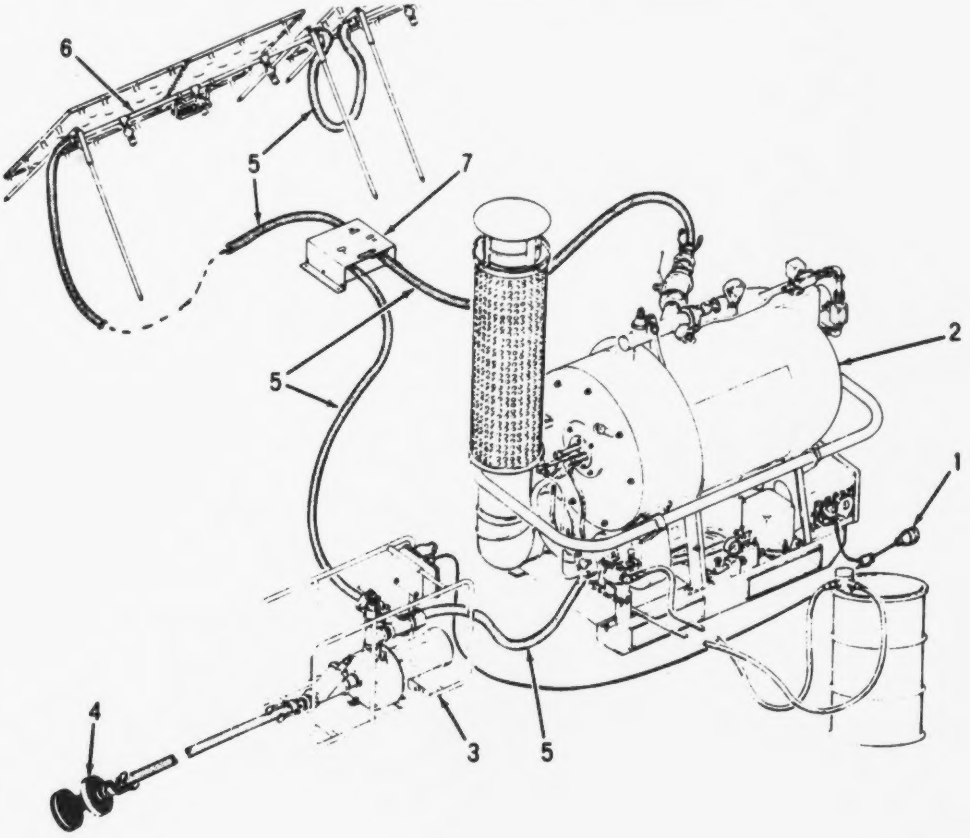
c. Disconnect and drain all water hoses (5) from shower stand (6) water pump (3), mixing valve assembly (7), and water heater (2).

d. Close fuel valve (paragraph 2-9 c).

e. Disconnect fuel lines connected in paragraphs 2-7 p and 2-7 q.

f. Stow fuel lines to adapter as in paragraph 2-6 k.

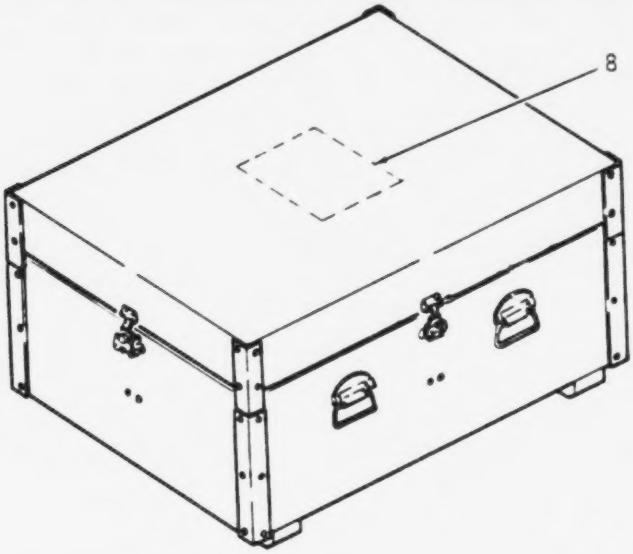
g. Disconnect smoke stack, installed in paragraph 2-7 1 and 2-7 m.

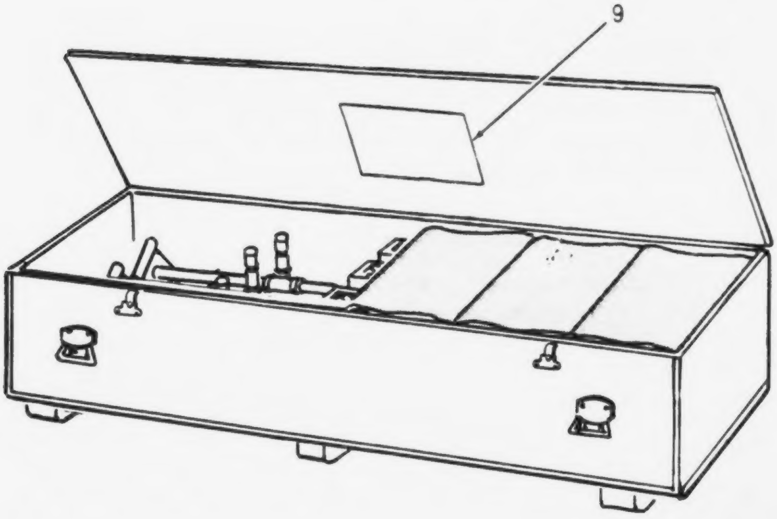


2-12. DISMANTLING BATH UNIT FOR MOVEMENT (CONT'D)

h. Pack water pump, mixing valve assembly, water hoses, strainer, and power cable assembly in container No. 1 per instructions (8) on inside lid of container.

i. Pack shower stand and legs, water hoses, and wind screens in container No. 2 per instructions (9) on inside lid of container.





Section IV. OPERATION UNDER UNUSUAL CONDITIONS

2-13. GENERAL

This section tells you how to operate the Bath Unit under severe or unusual conditions, for example, cold weather or dusty areas.

2-14. OPERATION IN COLD WEATHER

a. Fill water heater fuel drum after operation to prevent moisture from collecting.

b. Check for frozen or ruptured pipes, joints, connections, and hoses immediately after starting up the Bath Unit.

c. Take precautions to prevent water hose assemblies, water pump, and water heater from freezing.

d. After operation during freezing weather, the Bath Unit must be completely drained. Drain cocks must be left open and drain plug removed. Drain water from all hoses. Disassemble if necessary.

2-15. OPERATION IN DUSTY CONDITIONS

a. Keep all fuel containers covered tightly to prevent dust from contaminating fuel. Protect water heater and water pump from dust by enclosing units in a tent or by setting up a windbreak.

b. During operation, inspect burner electrodes through sight tube glass for proper spark. If spark moves up and down on electrodes instead of firing at electrode gap, notify organizational maintenance.

WARNING

If shelter is used during operation, ensure exhaust fumes are properly vented. Exhaust fumes are poisonous and must not be inhaled by personnel.

NOTE

Provide housing or shelter for the water heater when it is not in use for extended periods of time. A tarp can be used to cover the water heater to protect it from bad weather. The same tarp can be arranged as a windbreaker when the water heater is operated.

Section V. OPERATION OF AUXILLIARY EQUIPMENT

2-16. GENERAL

This section tells you how to operate auxilliary equipment used with the Bath Unit. Auxilliary equipment consists of a fire extinguisher.

2-17. FIRE EXTINGUISHER

A five-pound carbon dioxide (CO_2) fire extinguisher is suitable for all types of fire which may occur when using the Bath Unit. See Appendix A-6 for operation and maintenance instructions.

CHAPTER 3

OPERATOR MAINTENANCE

Section I. LUBRICATION INSTRUCTIONS

This chapter contains information for operator maintnenace. Operator maintenance includes inspections, preventive maintenance such as lubrication, operator checks, and general maintenance such as cleaning, filter cleaning or replacement and hose replacement. When a maintenance procedure calls for a higher level maintenance, the operator notifies the higher level maintenance personnel.

3-1. FUEL PUMP

WARNING

Exposed fuel and fuel vapor can ignite or explode, resulting in possible serious injury and even death. Observe proper safety precautions when servicing fuel system. Ensure that the water heater is cold before servicing burner.

When firing the fuel burner with gasoline, mix 1 quart (IL) oil (2 Appendix E) with each five gallons (20L) of gasoline. This mixture will provice internal lubrication for the fuel pump. To ensure a proper mixture, pour gasoline into the oil.

Section II. OPERATOR TROUBLESHOOTING PROCEDURES

3-2. GENERAL

This section contains troubleshooting information for locating and correcting most of the operating troubles which may develop in your Bath Unit. The troubleshooting procedures are listed in table 3-1. The table lists the common malfunctions which you may find during operation or maintenance of the Bath Unit or its components. You should perform the tests/inspections and corrective actions in the order listed. Each malfunction for an individual component, unit, or system is followed by a list of tests or inspections which will help you determine corrective actions to take.

3-3. TROUBLESHOOTING PROCEDURE

The symptom index lists the common malfunctions which you may find during the operation or maintenance of the Bath Unit. Use the symptom index for quick access to the troubleshooting procedures.

This manual cannot list all possible malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed (except where malfunction and cause are obvious) or is not corrected by listed corrective action, notify your supervisor.

SYMPTOM INDEX

Symptom	Troubleshooting Procedure Page
• Water heater fails to start	3-4
• Flame fails in burner	3-4
• Fuel pressure too high or too low	3-5
• Fuel pressure pulsates	3-5
• Fuel pump fails to deliver fuel to burner	3-5
• Water pump fails to deliver water	3-6
• Black smoke comes out of burner exhaust duct	3-7
• Shower stand nozzles not discharging enough water	3-7

Table 3-1. Operator Troubleshooting Procedures

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

1. WATER HEATER FAILS TO START

Step 1. Check that electrical power is available and properly connected to water heater.

Check power connections to water heater.

Step 2. Check load limit switch to see if it is tripped.

Reset load limit switch.

Step 3. Check flame safeguard control lockout switch and audible alarm.

Reset flame safeguard control switch.

Step 4. Check blower motor overload switch.

Reset blower motor overload switch.

Step 5. Check water supply in water heater tank.

Fill tank with water.

Step 6. Check motor contactor.

Reset motor contactor.

Notify organizational maintenance.

2. FLAME FAILS IN BURNER

Step 1. Check fuel supply in fuel drum.

Fill fuel drum.

Step 2. Inspect fuel hose for air leaks.

Tighten fuel hose connections.

Step 2.1. Check fuel filter strainer for obstructions.

Rotate fuel strainer handle to clear obstructions.

Table 3-1. Operator Troubleshooting Procedures (Cont'd)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

2. FLAME FAILS IN BURNER (CONT'D)

Step 3. Check feed and return fuel hose assemblies to see if they are reversed.

Disconnect and reconnect fuel hose assemblies in correct positon.

Step 4. Check fuel pump to verify that it has been primed.

Go to Preparation for Use, paragraph 2-8, to prime pump.

Step 5. Check ignition cable assemblies for loose connections at electrode and transformer end.

Turn power off and tighten connections at electrode and transformer ends.

3. FUEL PRESSURE TOO HIGH OR TOO LOW

Step 1. Check burner fuel control valve.

Turn valve fully left.

4. FUEL PRESSURE PULSATES

Step 1. Check fuel feed hose assembly for leaks.

Tighten fuel hose connections.

Step 2. Inspect strainer cover for loose hardware.

Tighten cover screws.

Step 3. Inspect fuel hoses for ruptures or damaged couplings. Replace hose and send to organizational maintenance.

5. FUEL PUMP FAILS TO DELIVER FUEL TO BURNER

Step 1. Check fuel supply in fuel drum.

Fill fuel drum.

Table 3-1. Operator Troubleshooting Procedures (Cont'd)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

5. FUEL PUMP FAILS TO DELIVER FUEL TO BURNER (CONT'D)

Step 2. Check both ends of fuel hoses for air leaks.

Tighten suction hose connections.

Step 3. Check supply and return hose assemblies to see if they are reversed.

Disconnect and reconnect them in proper position.

Step 4. Check fuel filter strainer for obstructions.

Rotate fuel strainer handle to clear obstructions.

6. WATER PUMP FAILS TO DELIVER WATER

Step 1. Make sure that suction strainer is not more than 15 feet below the water pump.

Move water pump closer to water source.

Step 2. Check shutoff valve.

Fully open valve by turning to right.

Step 3. Check pump to verify that it has been adequately primed.

Go to Start Up Procedures, paragraph 2-9,
to prime the pump.

Step 4. Check water source to see if the suction strainer is fully submerged (para 2-7)

Remove suction hose and place it in deeper water.

Step 5. Check hose assemblies for air leaks.

Replace gaskets in hose connections if necessary and tighten hose connections.

Table 3-1. Operator Troubleshooting Procedures (Cont'd)

MALFUNCTION
    TEST OR INSPECTION
        CORRECTIVE ACTION

---

6. WATER PUMP FAILS TO DELIVER WATER (CONT'D)

Step 6. Check suction hose to see if it is clogged.

Momentarily turn off water pump, remove suction strainer from water source, and clean trash from strainer. Insert strainer in water source and turn on water pump.

Step 7. Check water inlet strainer to see if it is clogged.

Remove water inlet strainer and clean strainer element. See Operator Maintentence Procedures, paragraph 3-4.

7. BLACK SMOKE COMES OUT OF BURNER EXHAUST DUCT

Step 1. Check to see if fuel-to-air ratio adjustment is correct (para 2-9).

Adjust shutter for proper volume of air intake.

8. SHOWER STAND NOZZLES ARE NOT DISCHARGING ENOUGH WATER.

Step 1. Check to see if shower nozzles are clogged.

Remove nozzle from shower head and clean.

Step 2. Check suction strainer to see if it is clogged.

Clean strainer element. See step 6, item 7.

Step 3. Check water flow control valve at shower nozzles.

Turn control valve to the full open position.

Step 4. Check mixing valve inlet and outlet connections for water leaks.

Tighten hose connections at mixing valve inlet and outlet.

Step 5. Check mixing valve assembly for improper operation.

Notify organizational maintenance.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

This chapter contains information on the following:

Section I Repair Parts, Special Tools, Test, Measurement and Diagnostic Equipment (TMDE), and Support Equipment

II Service Upon Receipt

III Organizational Preventive Maintenance Checks and Services (PMCS)

IV Organizational Troubleshooting Procedures

V Organizational Maintenance Procedures

Section I. REPAIR PARTS, SPECIAL TOOLS, TMDE AND SUPPORT EQUIPMENT

4-1. COMMON TOOLS AND EQUIPMENT

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

4-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

No special tools, TMDE, or support equipment is required for the Bath Unit.

4-3. REPAIR PARTS

Repair parts are listed and illustrated in the Repair Parts and Special Tools List (TM 10-4510-206-24P, to be published) covering organizational maintenance for this equipment.

Section II. SERVICE UPON RECEIPT

4-4. GENERAL

The Bath Unit is shipped in two reusable shipping containers and a water heater mounted on its own skids with holes to insert a forklift for lifting. Unpacking instructions are contained in paragraph 2-6. Inspect the equipment upon receipt as follows:

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on SF Form 364, Report of Deficiency.

b. Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA PAM 738-750.

c. Check to see whether the equipment has been modified.

Check out the Bath Unit by performing the setting up of Bath Unit instructions in paragraph 2-7.

Section III. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

4-5. GENERAL

a. Quarterly check. Always keep in mind the CAUTIONS and WARNINGS when you perform your quarterly check. A quarterly interval is equal to three calendar months or 250 hours of operation, whichever occurs first.

b. Failure to Operate. If your equipment fails to operate, troubleshoot with proper equipment. Report any deficiencies using the proper forms. See DA PAM 738-750.

4-6. PMCS PROCEDURES

a. General. The PMCS procedures are contained in table 4-1 below. They are arranged in logical sequence requiring a minimum amount of time and motion on the part of the persons performing them and are arranged so that there will be minimum interference between persons performing check simultaneously.

b. Item Number Column. Checks and services are numbered in chronological order regardless of interval. This column is used as a source of item numbers for the "TM Number" column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, in recording results of PMCS.

c. Item To Be Inspected Column. The items to be inspected are identified by a few words, usually the common name.

d. Procedures Column. This column contains a brief description of the procedure by which the check is to be performed. It contains all the information required to accomplish the checks and services, including appropriate tolerance, adjustment limits, and instrument and gage readings.

QUARTERLY

Table 4-1. Organizational Preventive Maintenance Checks and Services

B-Before Operation D-During Operation A-After Operation

Item No.	INTERVAL B	INTERVAL D	INTERVAL A	ITEM TO BE INSPECTED	PROCEDURE
				BATH UNIT	
1.				Miscellaneous Assemblies	1. Check power cables for loose or broken connections and cracked or deteriorated insulation. Check that power supply is properly connected and identified. 2. Check to be sure that suction strainer assembly is positioned away from debris and properly braced. 3. Check fuel hose assembly for loose connections, broken, bent or leaky fuel lines and hoses. Check fuel supply and return lines to verify that they are properly connected. 4. Check drum fill adapter assembly for proper installation and observe that assembly is not damaged or that leakage is evident.
2.				Shower Stand Assembly	1. Check assembly for missing or damaged risers, soap dish, or shower curtains. 2. Check shower nozzles for clogs or damage.
3.				Water Pump Assembly	1. Check pump for proper operation, leaks, and damage. 2. Check valves for proper operation and correct adjustment. 3. Service strainer by removing from housing and washing thoroughly with clear water.

QUARTERLY

Table 4-1. Organizational Preventive Maintenance Checks and Services (continued)

B-Before Operation D-During Operation A-After Operation

Item No.	INTERVAL			ITEM TO BE INSPECTED	PROCEDURE
	B	D	A		
				BATH UNIT (cont)	
				Water Pump Assembly (cont)	4. Check drain plugs and cocks for secure and tight fit.
4.				Water Heater Assembly	1. Check burner head assembly for damage. Check air hose for dirt or corrosion accumulation. Check burner nozzle for carbon and electrodes for carbon deposit. 2. Check manifold assembly for damaged or inoperative pressure relief valve, cracks, or leaks. 3. Check ignition cable assembly for proper spark. 4. Check blower and motor assembly for tight mounting hardware. Check air shutter spring-loader rivet for weakness. 5. Check fuel pump assembly for damage and leaks, service pump assembly by replacing or cleaning fuel filter. 6. Check boiler tank assembly for dents, breaks, cracks, and leaks. Evacuate to DS or GS maintenance if any of these conditions are evident. 7. Service boiler tank and skid by painting scratched or rusted areas. 8. Check UV scanner assembly for sight and scanner tube instructions. Check the scanner mounting is tight.

QUARTERLY

Table 4-1. Organizational Preventive Maintenance Checks and Services (continued)

B-Before Operation D-During Operation A-After Operation

Item No.	INTERVAL			ITEM TO BE INSPECTED	PROCEDURE
	B	D	A		
				BATH UNIT (cont)	
5.				Fire Extinguisher Assembly	1. Check that seal is not broken and that extinguisher is not damaged.
6.				Grounding Assembly	1. Check grounding wire by assuring that the following conditions are met: (a) Depth of 3/4" hollow rod or 5/8" solid rod is driven to a depth of at least 8 feet. (b) Minimum ground plate user is nine square feet (0.81 square meters) and buried to a depth of four feet (120 centimeters). (c) Cable is awg copper wire, bolted or clamped to the rod, and attached to the ground terminal of the power source.

Section IV. ORGANIZATIONAL TROUBLESHOOTING PROCEDURES

4-7. GENERAL

This section contains testing and troubleshooting information for locating and correcting most of the operating troubles which may develop in your bath unit. Each malfunction for an individual component, unit, or system is followed by a list of tests or inspections which will help you determine corrective action to take. You should perform the test/inspections and corrective actions in the order listed.

4-8. TROUBLESHOOTING PROCEDURES

The symptom index lists the common malfunctions which you may find during the operation or maintenance of the bath unit or its components. Use the symptom index for quick access to the troubleshooting procedures table 4-2.

This manual cannot list all possible malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed (except where malfunction and cause are obvious) or is not corrected by listed corrective actions, notify your supervisor.

SYMPTOM INDEX

Symptom	Troubleshooting Procedure Page
• Water heater fails to start	4-9
• Flame failure during firing cycle	4-10
• Fuel pressure gage indicates pressure too low	4-11
• Fuel pressure gage indicates pressure too high	4-11
• Noisy fuel pump	4-12
• Pressure gage indicates pulsating pressure	4-13
• Fuel pump leaks	4-13
• Fuel pump fails to deliver fuel to burner	4-13
• Burner fails to ignite or ignition is delayed	4-14
• Blower motor overload switch continues to trip	4-15
• Exhaust gases from smoke stack are smoky	4-15
• Smoke escaping from around boiler box cover	4-16
• Water temperature gage shows water overheats	4-16
• Blower and fuel pump motor noisy	4-16
• Water pump fails to deliver water	4-17
• Water pump fails to rotate	4-17
• Water pump assembly noisy	4-17
• Shower stand nozzles not discharging enough water	4-17

Table 4-2. Organizational Troubleshooting Procedures

MALFUNCTION
    TEST OR INSPECTION
        CORRECTIVE ACTION

---

1. WATER HEATER FAILS TO START

Step 1. Check source of electrical power supplied to water heater.

Check source of electrical power and connect to water heater, obtain power source and connect to water heater.

Step 2. Check load limit switch for electrical power out when switch is turned on.

Inspect master control box and notify direct support maintenance if faulty.

Inspect heater limit controls, adjust if necessary.

Step 3. Check flame safeguard control switch to see if it is tripped out.

Reset flame safeguard control. Call direct support maintenance if faulty.

Step 4. Check blower motor reset contactor to see if it is tripped.

Reset contactor.

If blower motor still does not run, replace blower motor.

Step 5. Check water supply in water heater tank.

Fill water heater tank with water.

Step 6. Check low water probe to see if it is defective.

Notify direct support maintenance.

Step 7. Check low water relay to see if it is defective.

Notify direct support maintenance.

Table 4-2. Organizational Troubleshooting Procedures (Cont'd)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

2. FLAME FAILURE DURING FIRING CYCLE

Step 1. Check fuel supply in fuel container.

Fill container with fuel.

Step 2. Check fuel hoses for leaks. Tighten couplings, replace fuel hose.

Step 3. Check fuel hose for clogs.

Disconnect fuel hose and clear all foreign matter and clogs from line.

Step 4. Check fuel nozzle for dirt and clogs.

Clean or replace nozzle. See paragraph 4-14.

Step 5. Check UV scanner tube to see if it is clogged.

Clear all obstructions from UV scanner tube.

Step 6. Check operation of flame safeguard control to see if it is defective.

Notify direct support maintenance.

Step 7. Check UV scanner to see if it is defective.

Notify direct support maintenance.

Step 8. Inspect fuel pump strainer to see if it is clogged.

Remove and clean strainer. See paragraph 4-14.

Step 9. Check fuel pump drive coupling for looseness.

Tighten pump drive coupling. See paragraph 4-14.

Step 10. Check fuel pump to see if it is defective.

Replace fuel pump. See paragraph 4-14.

Step 11. Check for presence of electric power at solenoid fuel valve.

Notify direct support maintenance.

Table 4-2. Organizational Troubleshooting Procedures (Cont'd)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

2. FLAME FAILURE DURING FIRING CYCLE (CONT'D)

Step 12. Check solenoid fuel valve to see if it is defective.

Replace solenoid fuel valve. See paragraph 4-14.

3. FUEL PRESSURE GAGE INDICATES PRESSURE TOO LOW

Step 1. Check to see if burner control valve is defective.

Replace burner control valve. See paragraph 4-14.

Step 2. Check fuel pump pressure to see if it is 100 psi.

Adjust pump pressure.

Step 3. Check to see if fuel filter is dirty or clogged.

Clean filter. See paragraph 4-14.

Step 4. Check for breaks in fuel hoses or loose couplings.

Tighten couplings or replace hose.

4. FUEL PRESSURE GAGE INDICATES PRESSURE TOO HIGH

Step 1. Check to see if fuel pressure gage is defective.

Replace fuel pressure gage. See paragraph 4-14.

Step 2. Check to see if fuel pump pressure is properly adjusted.

Adjust fuel pump pressure.

Step 3. Check to see if fuel nozzle is defective.

Clean fuel nozzle.

Replace fuel nozzle.

Step 4. Check to see if return fuel hose is restricted.

Disconnect return fuel hose and remove restriction.

Table 4-2. Organizational Troubleshooting Procedures (Cont'd)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

5. NOISY FUEL PUMP

Step 1. Check suction hose for leaks.

Tighten suction line connections.

Replace suction hose if cracked.

Step 2. Inspect to see if fuel pump strainer is clogged.

Clean fuel pump strainer.

Step 3. Check fuel filter to see if it is clogged or dirty.

Remove and replace fuel filter. See paragraph 4-14.

Step 4. Check to see if fuel pump is overheating or noisy.

Replace fuel pump.

Step 5. Check to see if fuel pump is primed.

Prime fuel pump.

6. PRESSURE GAGE INDICATES PULSATING PRESSURE.

Step 1. Inspect suction hose for leaks.

Tighten suction hose connections.

Step 2. Check to see if fuel pump strainer is clogged.

Remove and replace strainer. See paragraph 4-14.

Step 3. Check to see if fuel filter is clogged.

Remove and replace filter. See paragraph 4-14.

If fuel filter is not clogged, go to step 4.

Step 4. Check to see if burner nozzle is defective.

Replace burner nozzle. See paragraph 4-14.

Table 4-2. Organizational Troubleshooting Procedures (Cont'd)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

---

6. PRESSURE GAGE INDICATES PULSATING PRESSURE (CONT'D)

Step 5. Check to see if fuel pressure gage is defective.

Replace fuel pressure gage.

7. FUEL PUMP LEAKS

Step 1. Check to see if strainer cover is loose.

Tighten all cover screws.

Step 2. Check to see if plugs are loose.

Tighten plugs.

Step 3. Check shaft seals for leaks.

Replace fuel pump. See paragraph 4-14.

Step 4. Check fuel pump for cracks.

Replace fuel pump. See paragraph 4-14.

8. FUEL PUMP FAILS TO DELIVER FUEL TO BURNER.

Step 1. Check fuel supply in fuel container.

Fill fuel container.

Step 2. Check suction hose for any leaks.

Tighten suction hose connections.

Step 3. Check to see if pump rotation is reversed.

Interchange any two of the three 208 volt, 3-phase electrical supply lines at the power source.

Step 4. Check to see if supply and return fuel hoses are reversed.

Disconnect fuel lines and reconnect in proper place.

Table 4-2. Organizational Troubleshooting Procedures (Cont'd)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

8. FUEL PUMP FAILS TO DELIVER FUEL TO BURNER (CONT'D)

Step 5. Check fuel pump strainer for dirt or clogs.

Remove strainer and replace. See paragraph 4-14.

Step 6. Check for clogged fuel nozzle.

Remove nozzle and clean. See paragraph 4-14.

Step 7. Check fuel pump drive coupling for looseness.

Tighten fuel pump drive coupling. See paragraph 4-14.

Step 8. Check to see if solenoid valve activates.

Notify direct support maintenance.

Step 9. Check fuel hoses for restrictions.

Disconnect fuel hose and remove restriction.

9. BURNER FAILS TO IGNITE OR IS DELAYED.

Step 1. Check amount of fuel in fuel container.

Fill container with fuel.

Step 2. Check to see if fuel hoses are clogged.

Clean fuel hoses.

Clean fuel filter.

Step 3. Check to see if fuel nozzle is clogged.

Clean or replace fuel nozzle. See paragraph 4-14.

Step 4. Check for water in fuel.

Drain fuel supply and refill with proper fuel.

Step 5. Check electrodes for carbon deposits.

Clean electrodes.

Table 4-2. Organizational Troubleshooting Procedures (Cont'd)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

9. BURNER FAILS TO IGNITE OR IS DELAYED (CONT'D)

Step 6. Check electrodes for proper adjustment.

Adjust electrodes. See paragraph 4-14.

Step 7. Check ignition transformer for signs of damage.

Replace ignition transformer. See paragraph 4-14.

Step 8. Check to see if cable assembly connection from transformer to burner is disconnected.

Connect cable assembly.

Step 9. Check electrode porcelain for breaks or cracks.

Replace electrode. See paragraph 4-14.

10. BLOWER MOTOR CONTACTOR CONTINUES TO TRIP

Step 1. Check fuel pump and motor for obstructions or binding.

Loosen setscrew at fuel pump shaft and check blower rotation.

Replace fuel pump or motor.

11. EXHAUST GASES FROM SMOKE STACK ARE SMOKY

Step 1. Check burner electrode spark.

Adjust electrodes.

Replace electrodes.

Step 2. Check for contaminated fuel.

Replace fuel if contaminated.

Step 3. Check to see if nozzles and screen are clogged.

Clean or replace clogged nozzles. See paragraph 4-14.

Step 4. Check blower operation for obstruction.

Loosen setscrew at fuel pump shaft and check blower rotation.

Table 4-2. Organizational Troubleshooting Procedures (Cont'd)

MALFUNCTION
    TEST OR INSPECTION
        CORRECTIVE ACTION

---

11. EXHAUST GASES FROM SMOKE STACK ARE SMOKY (CONT'D)

Step 5. Check for low output voltage from power source.

Adjust power source output voltage.

12. SMOKE ESCAPING FROM AROUND SMOKE BOX COVER

Step 1. Check boiler box gasket for excessive wear and deterioration.

Replace gasket. See paragraph 4-14.

Step 2. Check to see if nuts securing smoke box cover and burner head assembly are torqued properly.

Torque nuts. See paragraph 4-14.

13. WATER TEMPERATURE GAGE SHOWS WATER OVERHEATS

Step 1. Check 0-250°F temperature control setting to see if it is too high.

Adjust 0-250°F temperature control.

Step 2. Check 0-250°F temperature control to see if it is defective.

Replace 0-250°F temperature control. See paragraph 4-14.

Step 3. Check for defective low water probe.

Notify direct support maintenance.

14. BLOWER AND FUEL PUMP MOTOR NOISY

Step 1. Check blower obstruction.

Feel blower motor to see if it overheats.

Loosen setscrew at fuel pump shaft and check blower rotation.

Replace blower motor.

Table 4-2. Organizational Troubleshooting Procedures (Cont'd)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

15. WATER PUMP FAILS TO DELIVER WATER

Step 1. Check to see if water pump motor runs.

Replace water pump motor.

Notify direct support maintenance.

Step 2. Check water pump for reversed rotation.

Interchange any two of the external leads at the motor.

Step 3. Check water pump shaft seals for leaks.

Replace water pump motor.

16. WATER PUMP FAILS TO ROTATE

Step 1. Check to see if electric motor is operating.

Tighten electrical connections.

Replace motor. See paragraph 4-14.

17. WATER PUMP ASSEMBLY NOISY

Step 1. Check water pump assembly for proper operation.

Replace water pump motor. See paragraph 4-14.

18. SHOWER STAND NOZZLES NOT DISCHARGING ENOUGH WATER

Step 1. Check water flow control valves at shower nozzles to see if they are closed or damaged.

Replace water flow control valve.

Step 2. Check for shower stand closed or pinched fittings.

Replace fittings.

Section V. ORGANIZATIONAL MAINTENANCE PROCEDURES

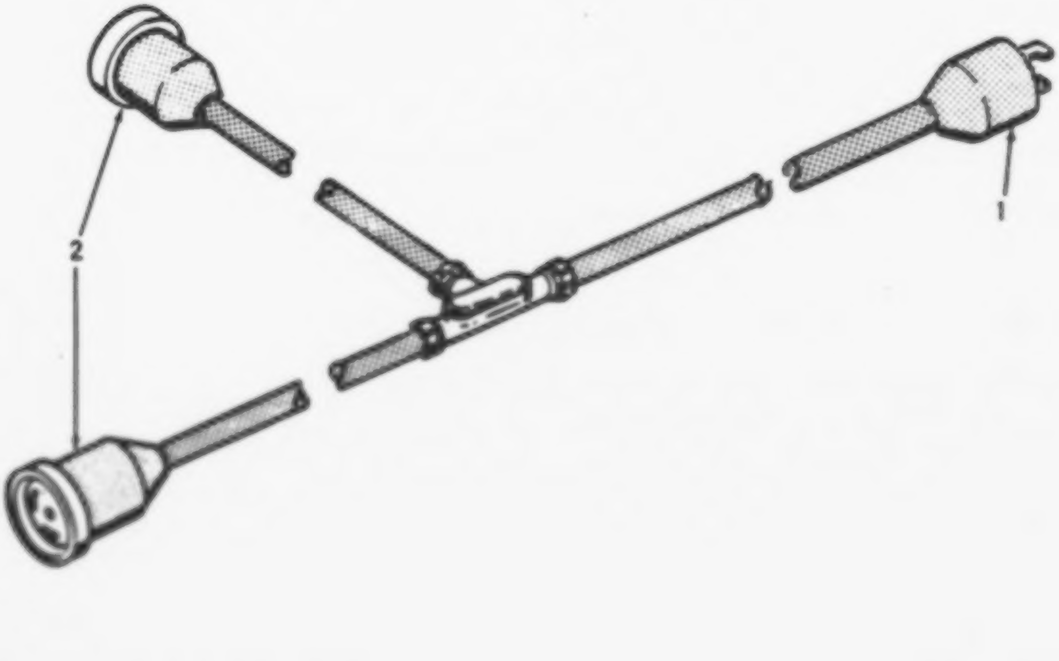
4-9. GENERAL

This section provides instructions for inspection, service, replacement or repair of assemblies and subassemblies of the Bath Unit. Each maintenance procedure contains step-by-step instructions for the task to be performed. Where necessary, a final test will be performed on the serviced or repaired item to assure minimum performance.

4-10. MISCELLANEOUS ITEMS MAINTENANCE PROCEDURES

a. Power Cable Assemblies. These instructions tell how to test the power cables by checking continuity. If a test fails to show continuity, replace the cable.

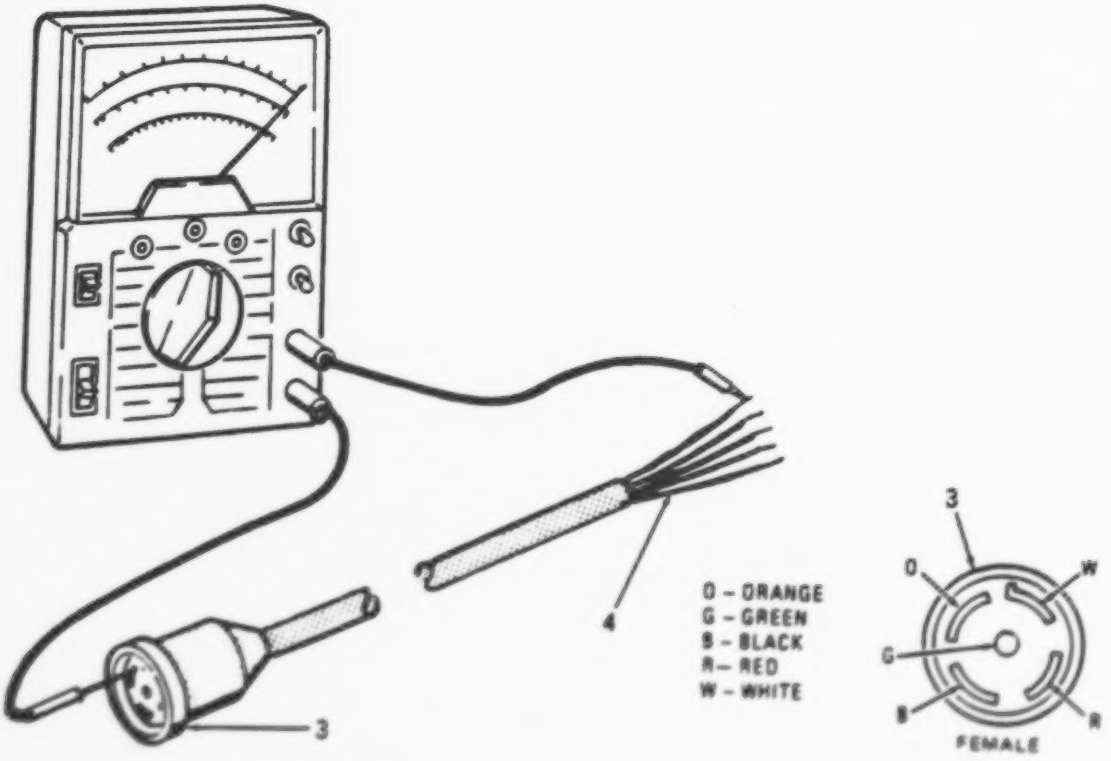
1. Check continuity of Bath Unit cable from one male connector pin (1) to mating pin on female connector (2). Repeat procedure for remaining four connector pins.
2. Repeat step 1 by checking continuity from each male connector pin to mating pins on remaining female connector.



4-10. MISCELLANEOUS ITEMS MAINTENANCE PROCEDURES (CONT'D)

a. Power Cable Assemblies Cont'd

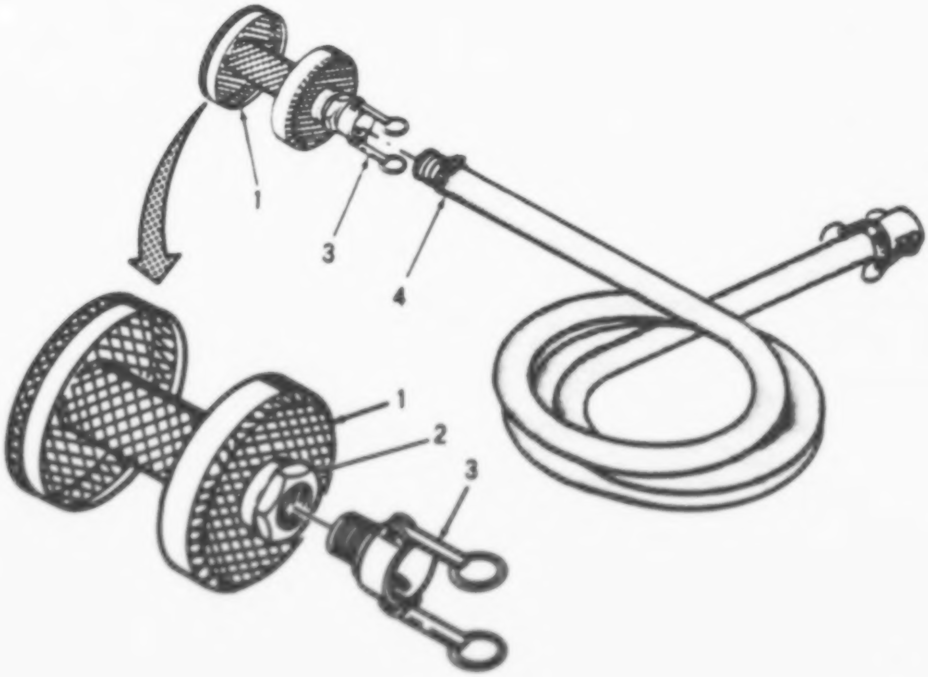
3. Check continuity of power unit cable connector end (3) to labeled wires (4) at other end of cable. Repeat procedure for all connector pins.



4-10. MISCELLANEOUS ITEMS MAINTENANCE PROCEDURES (CONT'D)

b. Suction Strainer. These procedures tell how to replace the suction strainer.

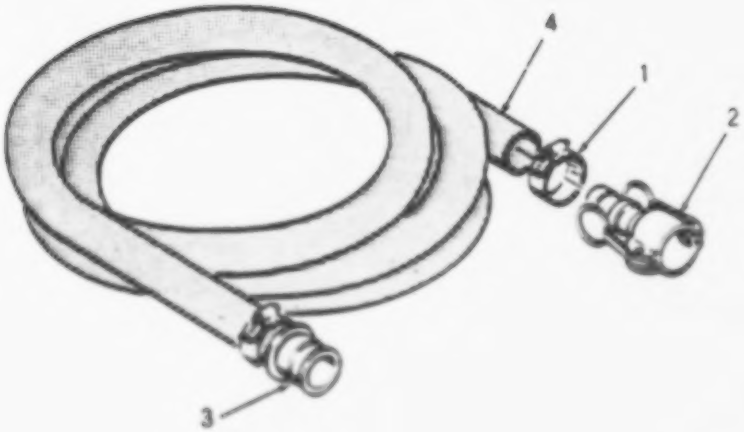
1. Remove strainer (1) with bushing (2) and half coupling (3) from water pump discharge hose assembly (4).
2. Unscrew and remove bushing (2) and half coupling (3) from strainer (1).
3. Coat bushing (2) threads with pipe compound (14, Appendix E) and screw bushing (2) and half coupling (3) into strainer (1).
4. Install suction strainer assembly (1) into water pump discharge hose (4).



4-10. MISCELLANEOUS ITEMS MAINTENANCE PROCEDURES (CONT'D)

c. Water Hoses and Couplings. These procedures tell how to repair all water hoses. If the hose is broken near the coupling, repair can be done by cutting off the damaged hose end and replacing the coupling. If hose damage is near the center of the hose, replace the hose with a section of new hose the same length as the old hose. Repair the hose as follows:

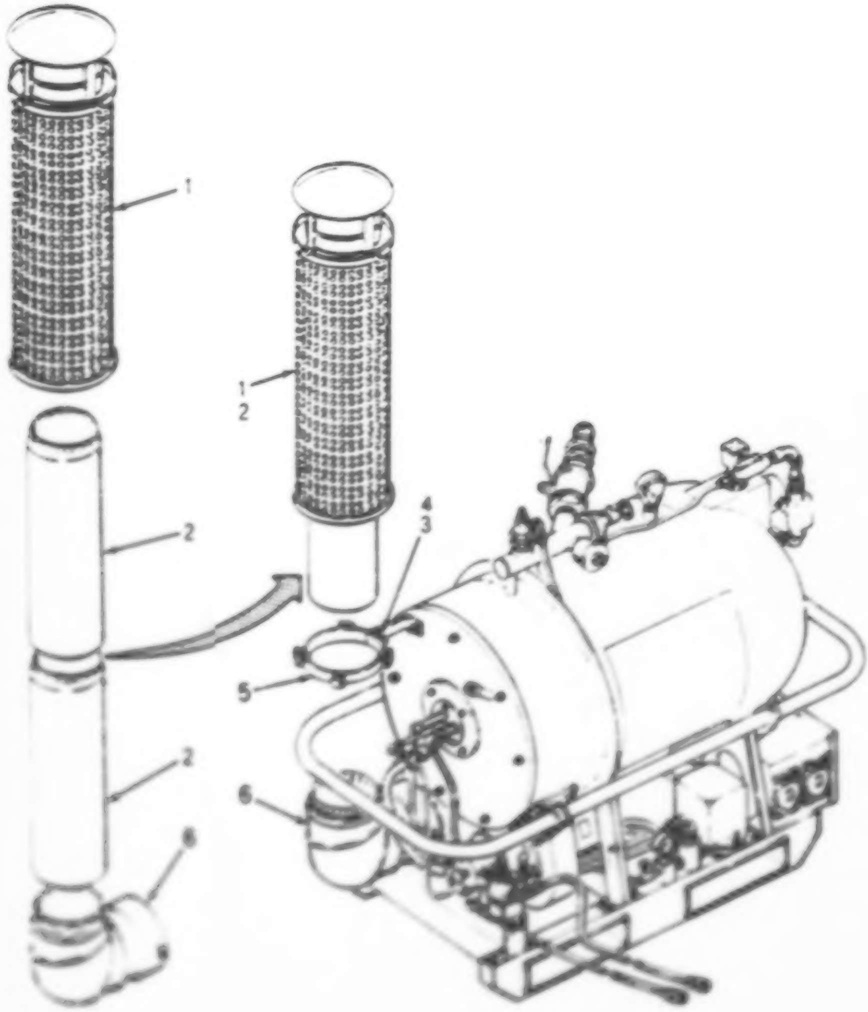
1. Cut hose clamps (1) holding coupling (2, 3) to water hose (4).
2. Remove coupling (1) and slide coupling out of hose.
3. Cut off damaged water hose.
4. Slide new hose clamp (1) over end of hose.
5. Insert coupling (2, 3) and tighten clamp.



4-10. MISCELLANEOUS ITEMS MAINTENANCE PROCEDURES (CONT'D)

d. Smoke Stack and Guard Assembly. Repair the smoke stack and guard assembly by removing and replacing the components. Proceed as follows:

1. Firmly grasp smoke stack and guard assembly (1) and lift upward to clear smoke stack (2).
2. Loosen nut and screw (3 and 4) on flue support (5) and remove smoke stack (2).
3. Separate two sections of stove pipe (2).
4. Twist elbow (6) to left and pull out to remove.



4-10. MISCELLANEOUS ITEMS MAINTENANCE PROCEDURES (CONT'D)

d. Smoke Stack and Guard Assembly (Cont'd)

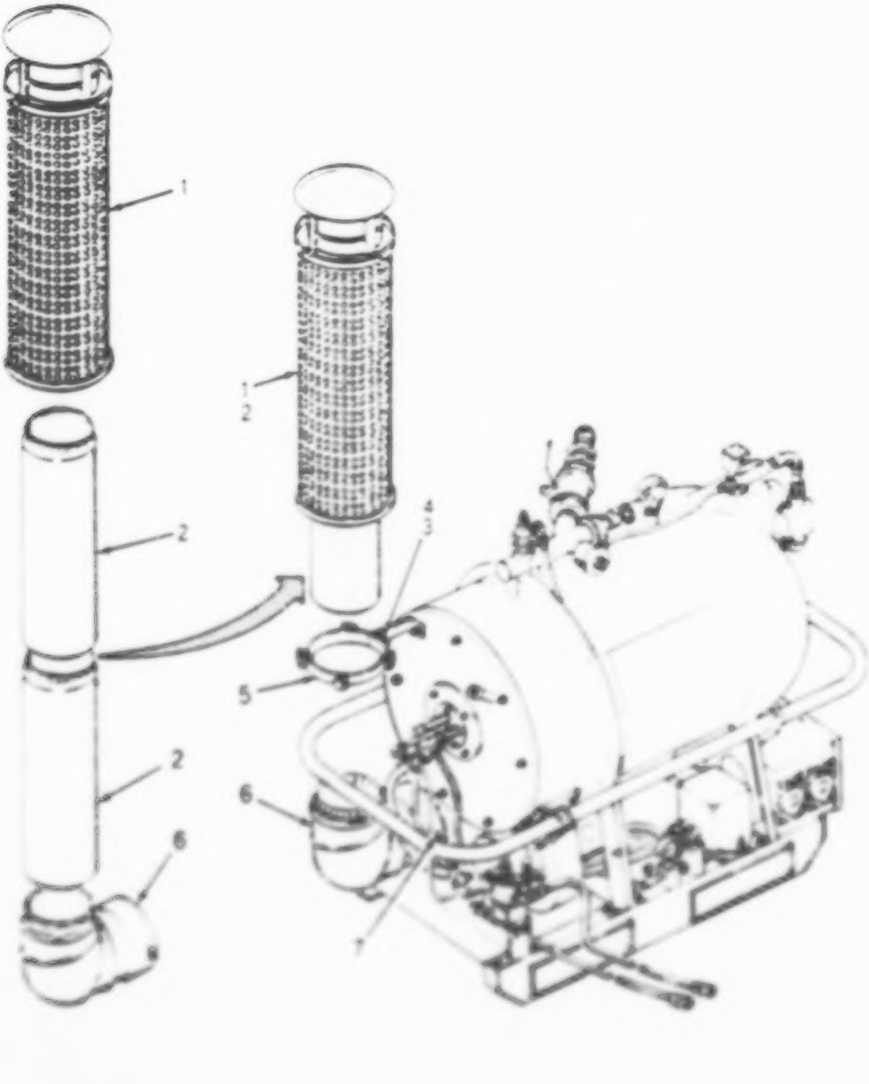
5. Place elbow (6) over two mounting studs (7) and turn to right until secure.

6. Assemble smokestack (2).

7. Insert smokestack (2) through flue support (5) and over elbow (6).

8. Tighten screw and nut (3, 4).

9. Lift smokestack guard assembly (1) and slide down over smokestack (2).



4-10. MISCELLANEOUS ITEMS MAINTENANCE PROCEDURES (CONT'D)

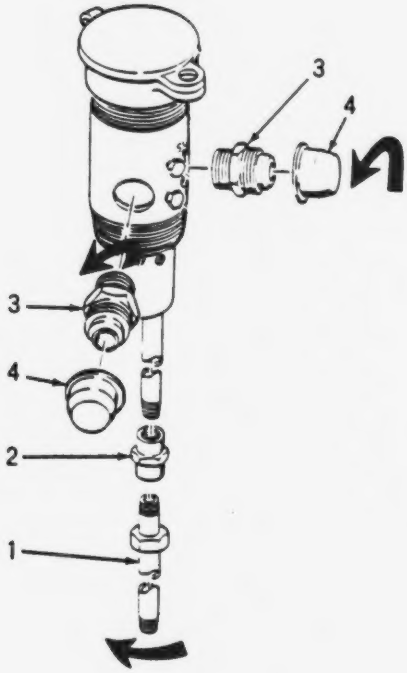
e. Fuel Hoses. Notify direct support maintenance for repair or replacement.

f. Drum Fill Adapter Assembly (Type II). These procedures tell how to repair the drum fill adapter assembly.

1. Remove extension adapter (1) from pipe connector (2) by turning counterclockwise.

2. Remove pipe connector (2) by turning counterclockwise.

3. Remove two male connectors (3) by turning counterclockwise and remove cap (4) from connectors.



4-10. MISCELLANEOUS ITEMS MAINTENANCE PROCEDURES (CONT'D)

f. Drum Fill Adapter Assembly (Type II) (Cont'd)

4. Remove two screws and four washers (5, 6) and remove block (7) and adapter pipe (8).

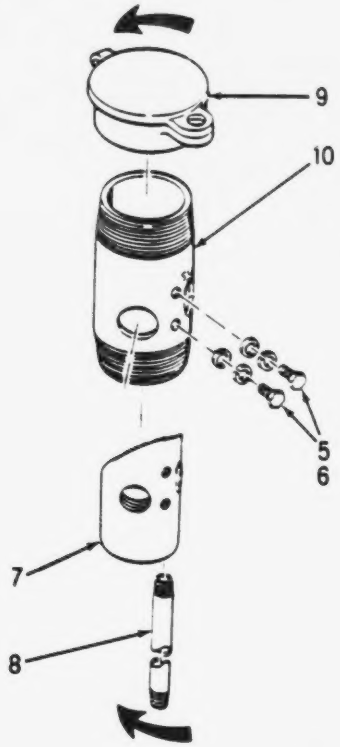
5. Remove adapter pipe (8) from block (7) by turning counterclockwise.

6. Remove cover (9) from nipple (10) by turning counterclockwise.

NOTE

Use pipe compound (14, Appendix E) on pipe threads before installation.

7. Attach cover (9) to nipple (10) by turning clockwise.



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4-10. MISCELLANEOUS ITEMS MAINTENANCE PROCEDURES (CONT'D)

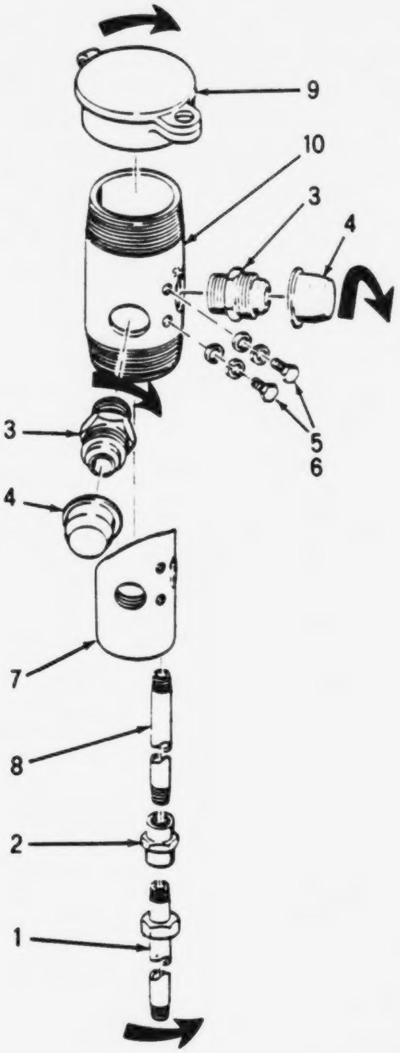
f. Drum Fill Adapter Assembly (Type II) (Cont'd)

8. Install adapter pipe (8) in block (7) by turning clockwise.

9. Install block (7) and adapter pipe (8) in nipple (10) using two screws and four washers (5, 6).

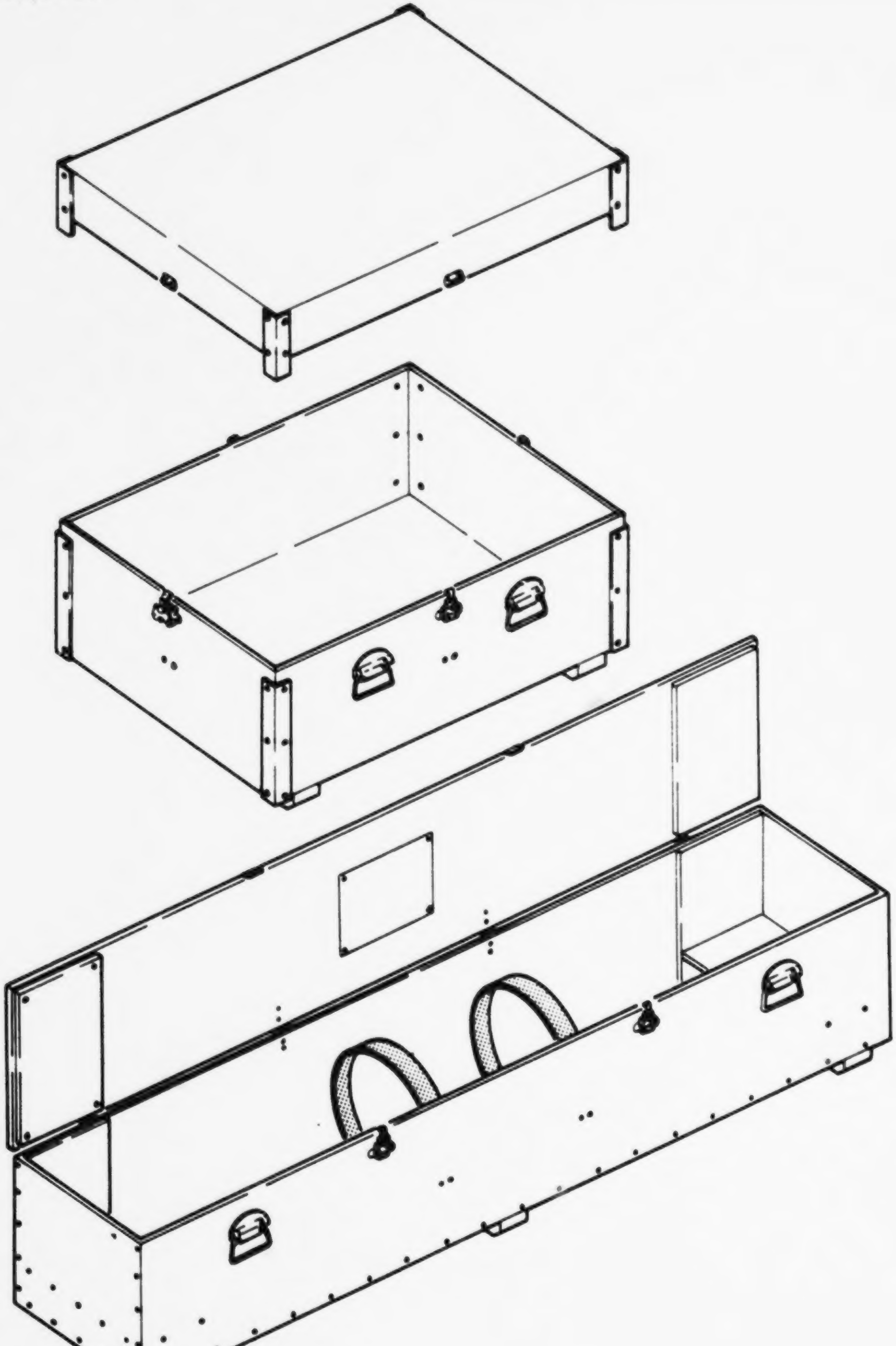
10. Install two male connectors (3) in nipple (10) by turning clockwise and snap two caps (4) on connectors (3).

11. Install pipe connector (2) on adapter pipe (8) and install extension adapter (1) on pipe connector (2).



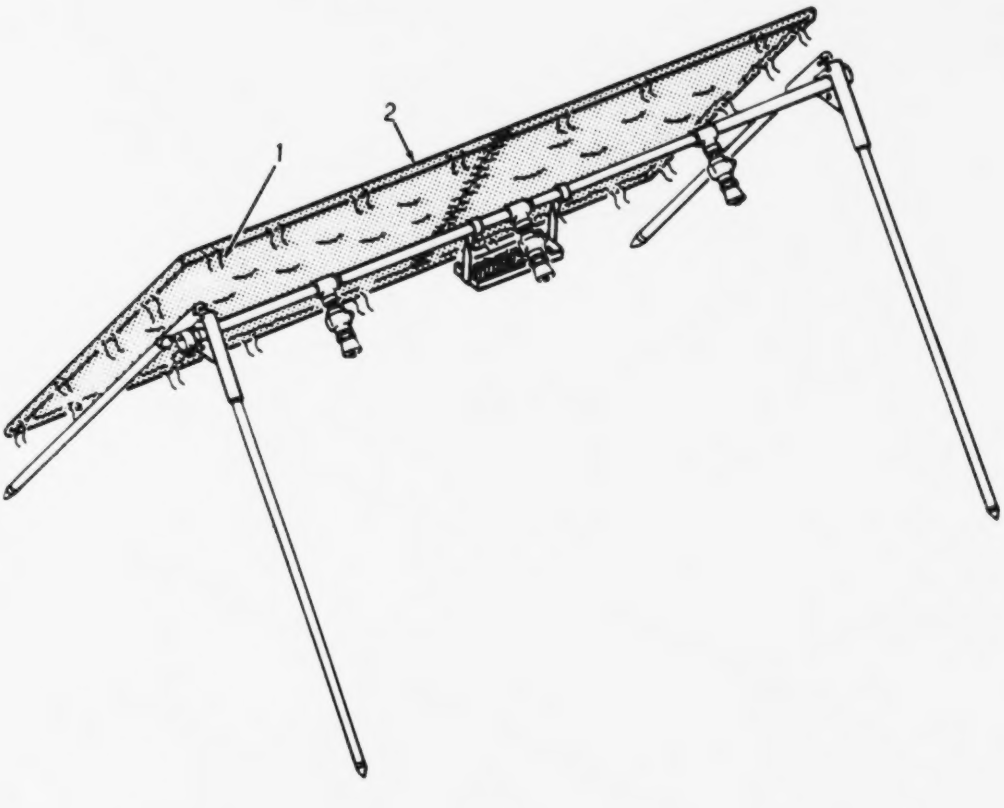
4-10. MISCELLANEOUS ITEMS MAINTENANCE PROCEDURES (CONT'D)

g. Shipping Containers. If a shipping container or lift handles and brackets become damaged, replace shipping container and notify direct support.



4-11. SHOWER STAND ASSEMBLY MAINTENANCE PROCEDURES

a. Shower Stand Windbreaker. If the shower stand windbreaker becomes torn or otherwise unusable, unstrap 24 tiedown straps (1) and remove windbreaker (2).



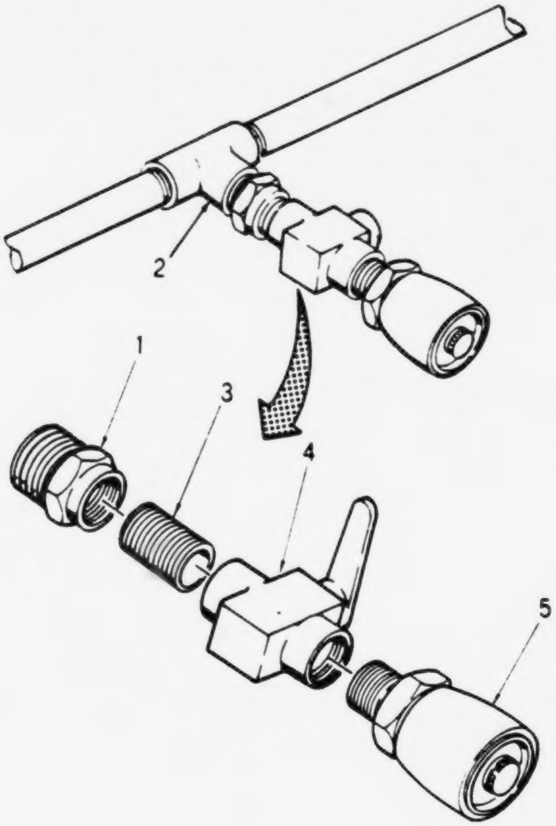
4-11. SHOWER STAND ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

b. Water Flow Control Valve and Shower Nozzle. Repair the water flow valve and shower nozzle as follows: Remove and replace only those components necessary to effect repair.

1. Turn bushing (1) counterclockwise and remove from tee (2).

2. Unscrew nipple (3) from valve (4) by turning counterclockwise.

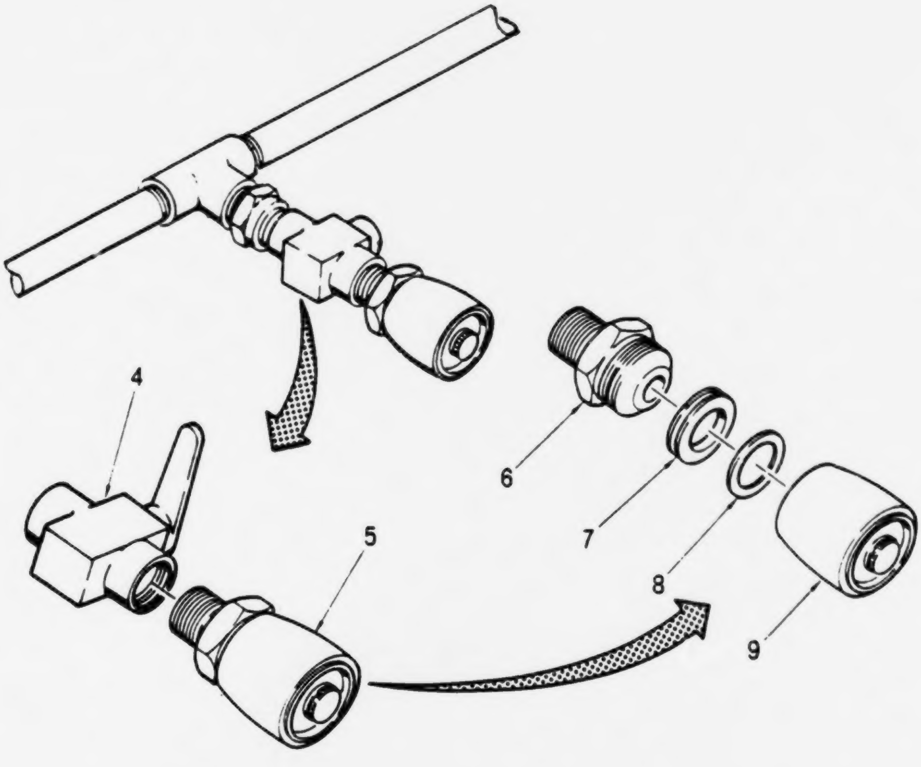
3. Unscrew valve (4) from nozzle assembly (5) by turning counterclockwise.



4-11. SHOWER STAND ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

b. Water Flow Control Valve and Shower Nozzle (Cont'd)

4. Unscrew adapter (6) by turning counterclockwise and remove gasket (7) and washer (8) and shower head (9).



4-11. SHOWER STAND ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

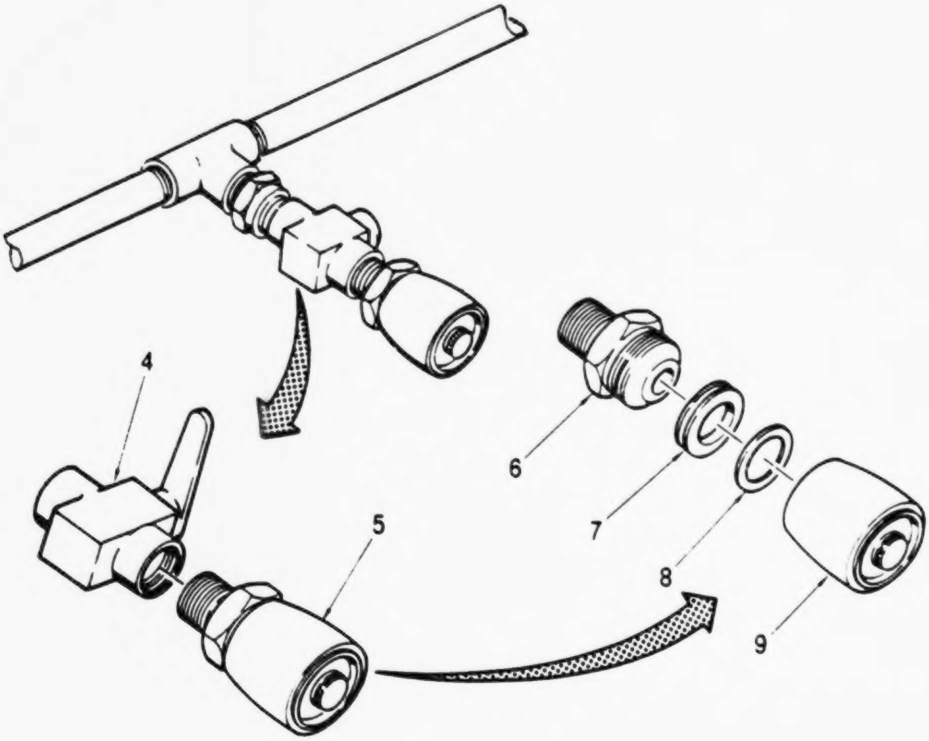
b. Water Flow Control Valve and Shower Nozzle (Cont'd)

NOTE

Use pipe joint compound (commercial grade) when joining pipes and fittings.

5. Replace defective gasket (7) and assemble shower head (9), adapter (6), gasket (7), and washer (8).

6. Install nozzle assembly (5) in valve (4) by turning clockwise.

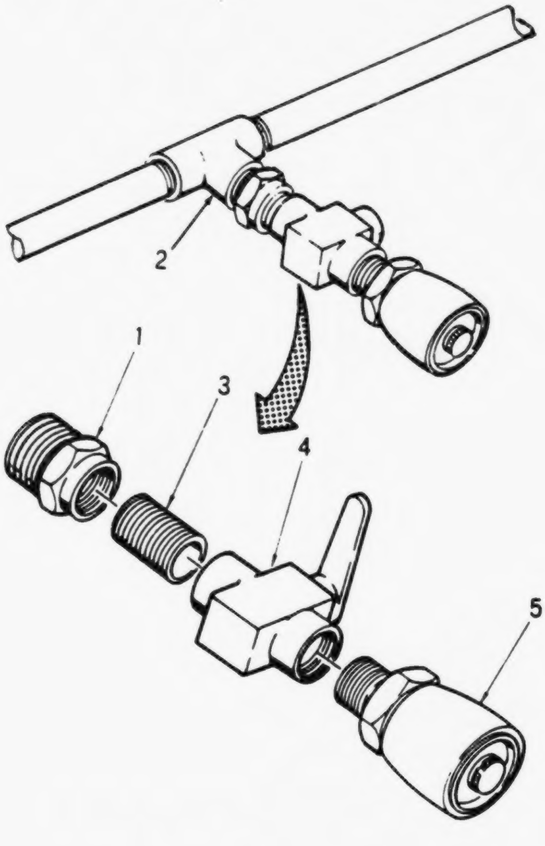


4-11. SHOWER STAND ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

b. Water Flow Control Valve and Shower Nozzle (Cont'd)

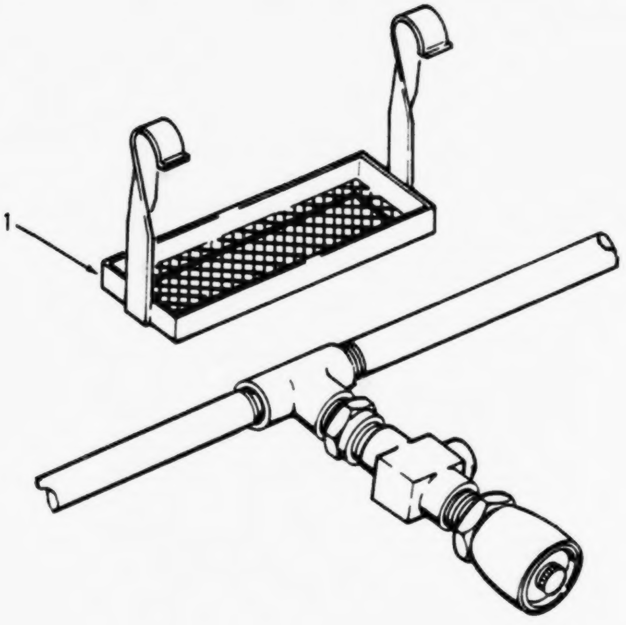
7. Install valve (4) onto nipple (3) by turning clockwise.

8. Assemble nipple (3), bushing (1), and install into tee (2).



4-11. SHOWER STAND ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

c. Soap Dish. The soap dish (1) is constructed in one piece. If it becomes bent, straighten it and if broken, replace it.

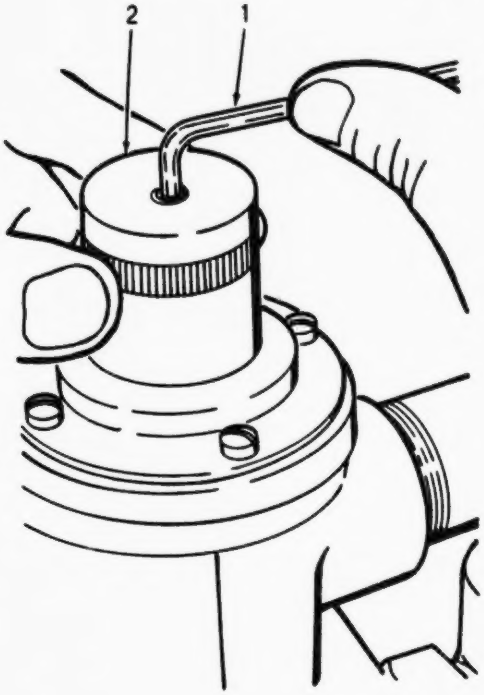


4-12. MIXING VALVE ASSEMBLY MAINTENANCE PROCEDURES

Mixing valve assembly maintenance is limited to adjustments of water temperature and minor repair of the assembly cover and base. Replace the assembly if discharge water temperature varies, water leaks at body gaskets, or water flow is less than desired or cut off.

a. Maximum Temperature Setting. Adjust maximum discharge temperature for 115°F (46°C) as follows:

1. Insert hex key, (1) into temperature control knob (2).
2. Hold adjustment knob (2) and turn hex key (1) clockwise to increase maximum temperature and turn counterclockwise to lower maximum temperature.



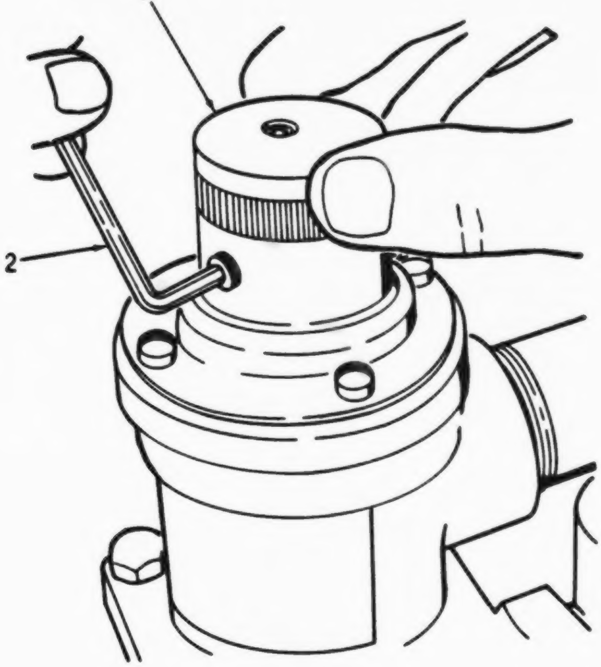
4-12. MIXING VALVE ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

b. Temperature Adjustment and Lock. To vary discharge water temperature under normal operating conditions:

1. Unlock adjustment knob (1) by inserting hex key into side of adjustment knob and turning counterclockwise.

2. Turn adjustment knob (1) clockwise to increase temperature and turn knob counterclockwise to decrease temperature.

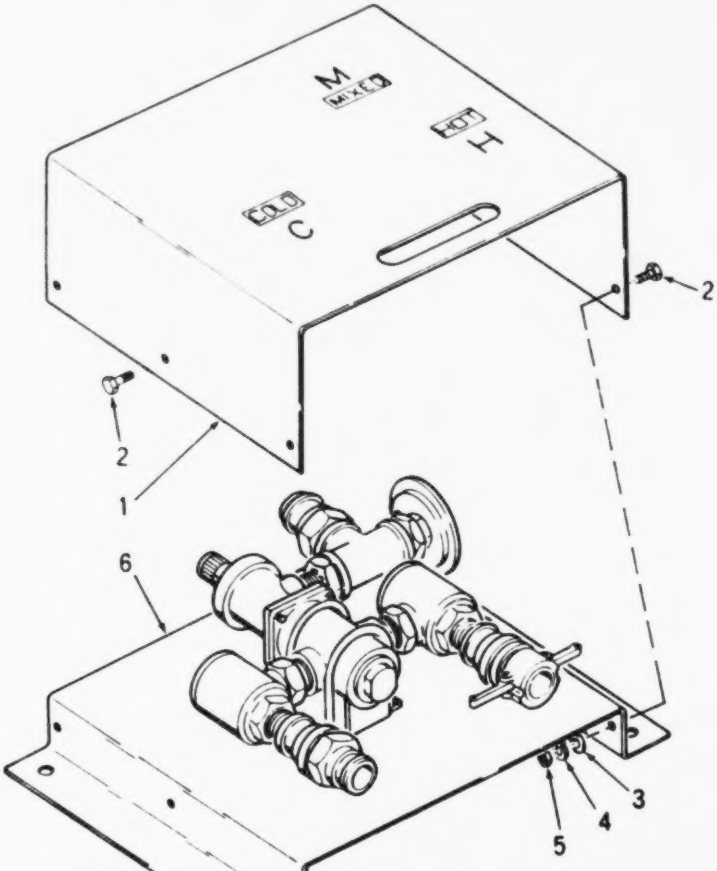
3. To lock temperature setting, insert hex key (2) into side of adjustment knob (1) and turn clockwise until tight.



4-12. MIXING VALVE ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

c. Cover and Base Repair. Cover and base repair consists of removal, if necessary, straightening, and paint touch up. Remove and replace cover and base as follows:

1. Remove top cover (1) by removing six screws (2), lockwashers (3), plain washers (4), and nuts (5). Lift cover (1) straight up and away from base (6).

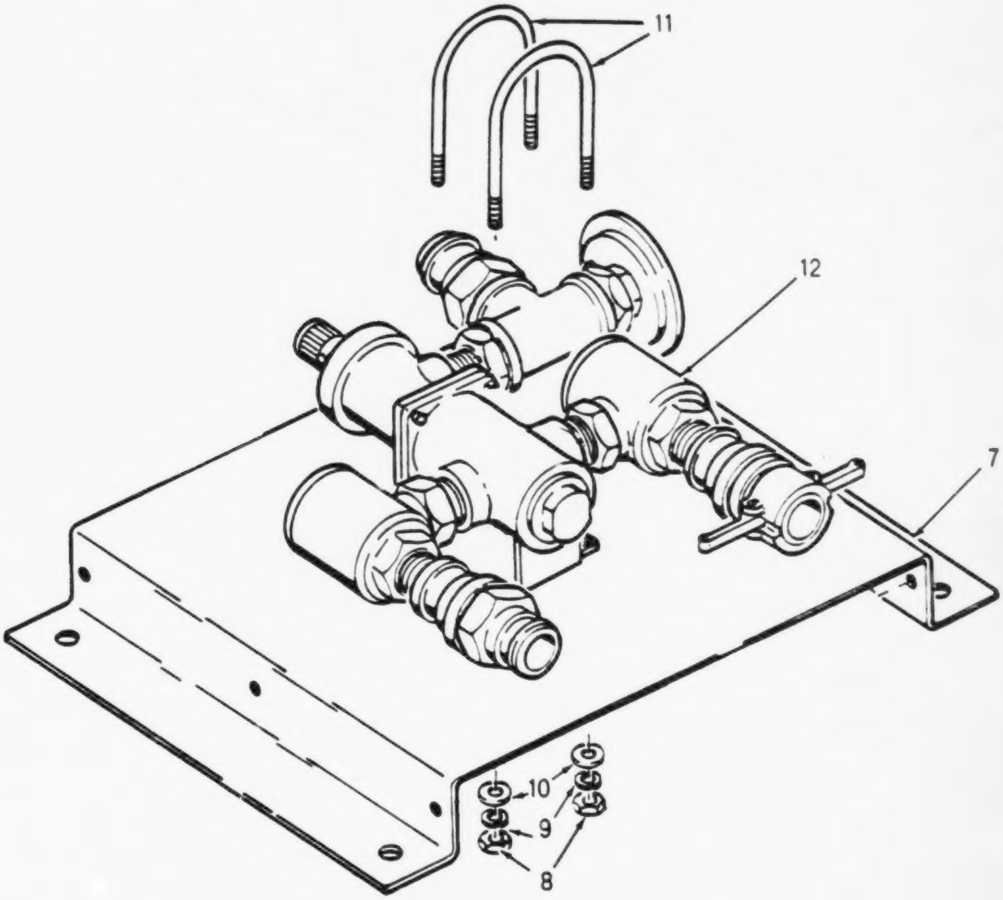


4-12. MIXING VALVE ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

c. Cover and Base Repair (Cont'd)

2. Remove base (7) by removing four nuts (8) four lockwashers (9), and four flat washers (10) from two clamps (11).

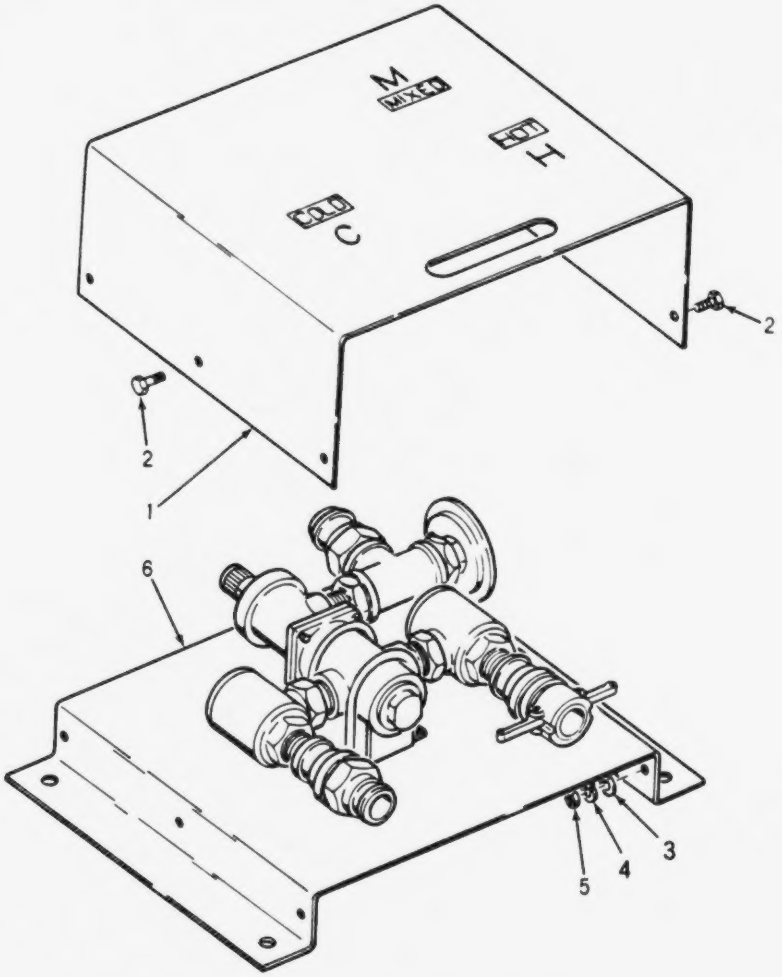
3. To install base (7), set valve assembly (12) in place on base (7), insert two clamps (11), and secure with two flat washers (10), two lockwashers (9) and four nuts (8).



4-12. MIXING VALVE ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

c. Cover and Base Repair (Cont'd)

4. Install top cover (1) and secure using six bolts (2), lockwashers (3), plain washers (4), and nuts (5) onto base (6).



4-13. WATER PUMP ASSEMBLY MAINTENANCE PROCEDURES

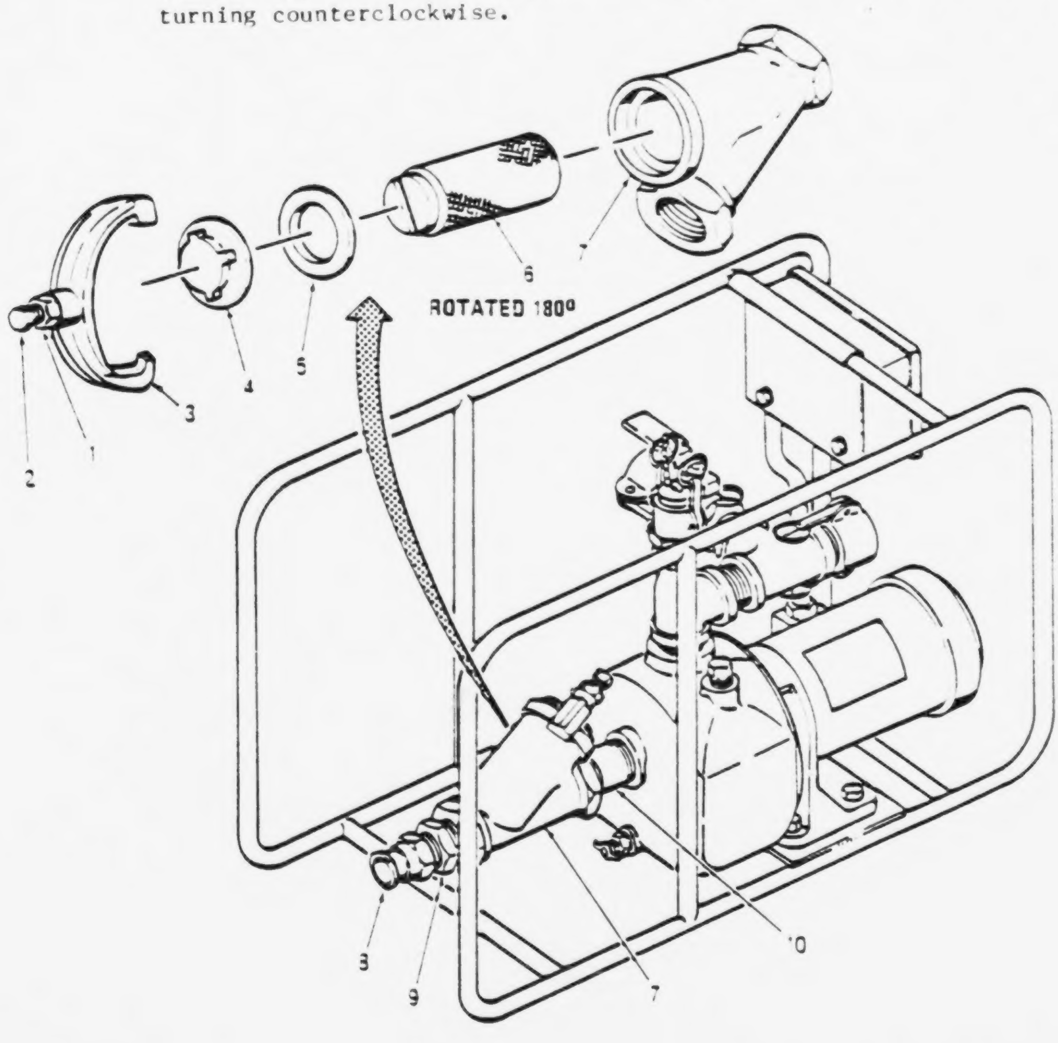
Water pump assembly maintenance is limited to repair of inlet water line strainer and electrical fittings, conduit, and wiring. Replace other water pump assembly components if defective. Paint any exposed metal.

a. Inlet Water Line Strainer. Remove strainer for inspection and cleaning. Remove other defective components and replace. For item replacement, proceed as follows:

1. Loosen nut (1) and unscrew bolt (2) and remove clamp (3).

2. Remove strainer caps (4), washer (5), and strainer (6) from strainer housing (7).

3. To replace strainer housing (7), remove half coupling (8) and reducer (9) and remove strainer housing (7) from nipple (10) by turning counterclockwise.



4-13. WATER PUMP ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

a. Inlet Water Line Strainer (Cont'd)

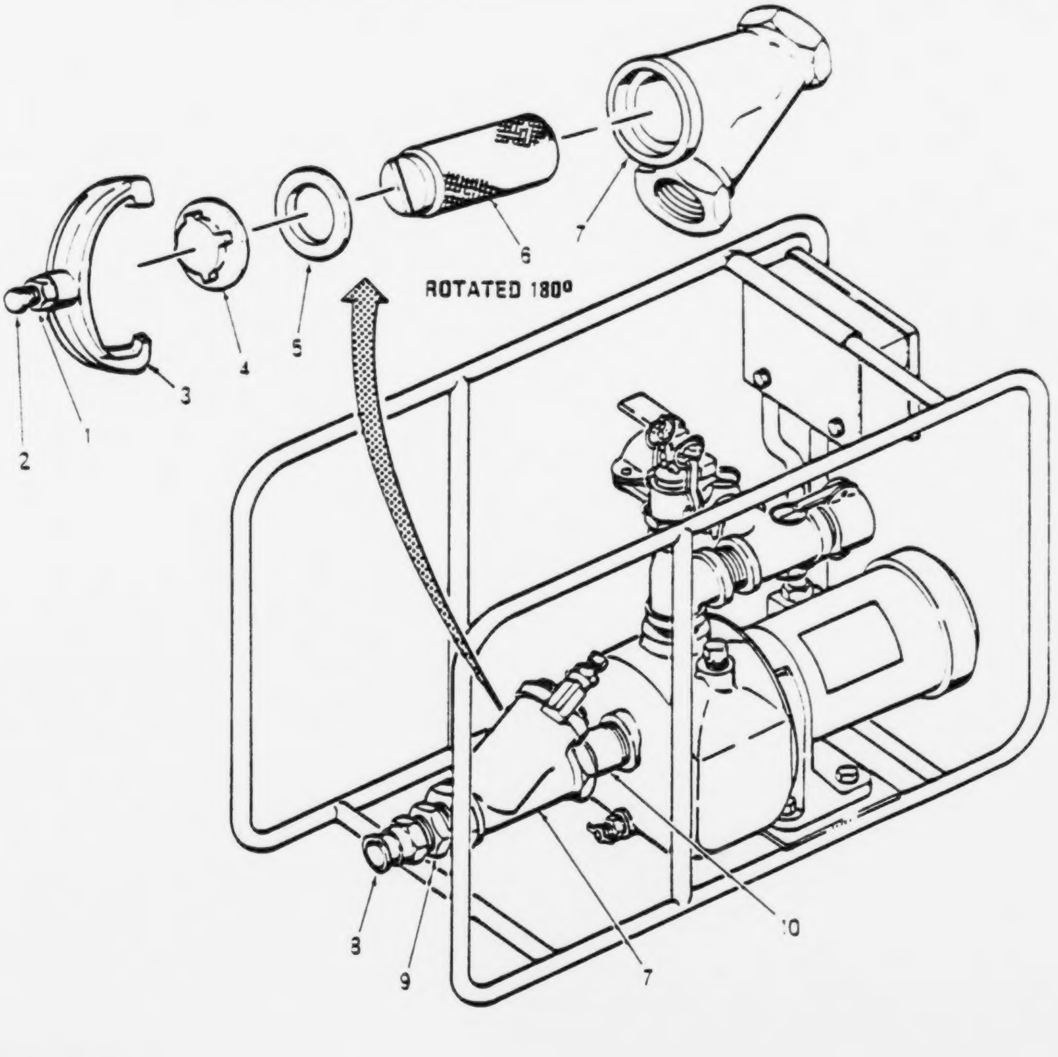
NOTE

Use pipe joint compound (commercial grade) when joining pipes and fittings.

4. Join strainer housing (7) to nipple (10) and join reducer (9) and half coupling (8) to strainer housing (7).

5. Insert strainer (6), washer (5) and strainer cap (4) in strainer housing (7) and secure with clamp (3).

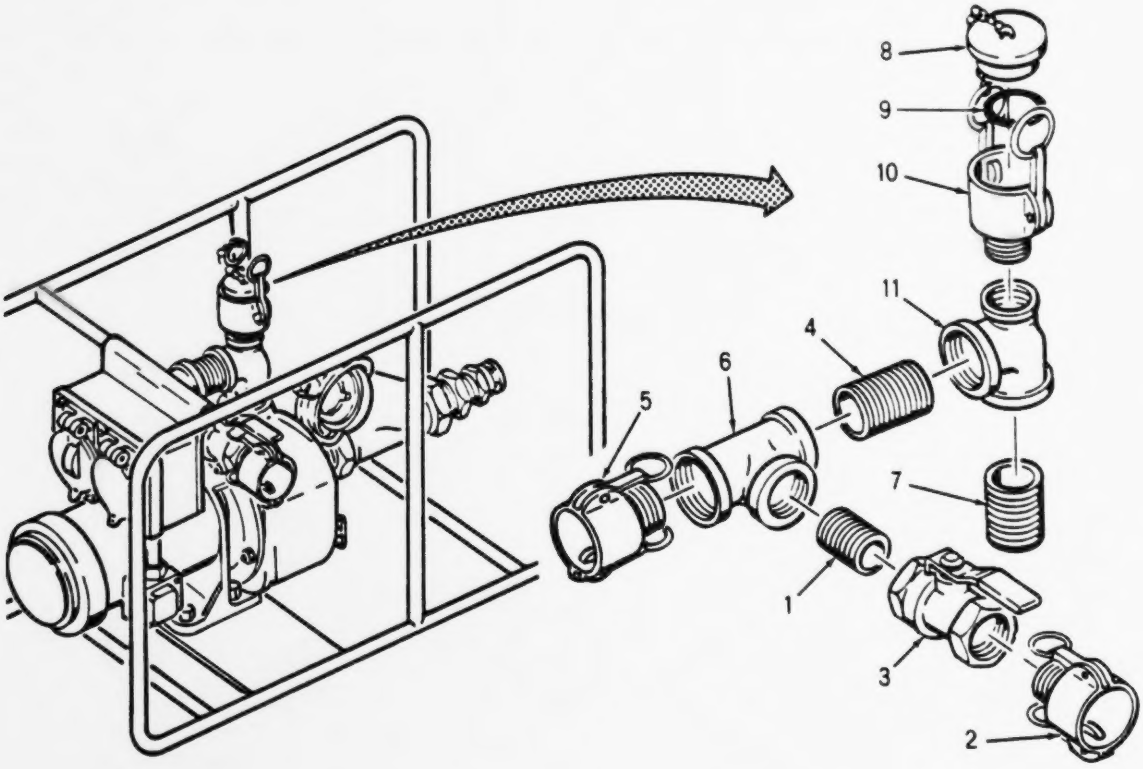
6. Tighten bolt (2) until clamp (3) secures strainer cap (4) and lock bolt with nut (1).



4-13. WATER PUMP ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

b. Water Outlet Assembly. Repair the water outlet assembly by replacing the defective component. Use these procedures in preparation for replacing the water pump. Dissassemble only as necessary.

1. Unscrew nipple (1) from tee (6) and dissassemble half coupling (2), valve (3) and nipple (1).
2. Unscrew nipple (4) and dissassemble plug (5), nipple (4), and tee (6).
3. Unscrew nipple (7) and disassembly plug (8), gasket (9), half coupling (10), tee (11), and nipple (7).



4-13. WATER PUMP ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

b. Water Outlet Assembly (Cont'd)

NOTE

Use pipe joint compound (14, Appendix E) when joining pipes and fittings.

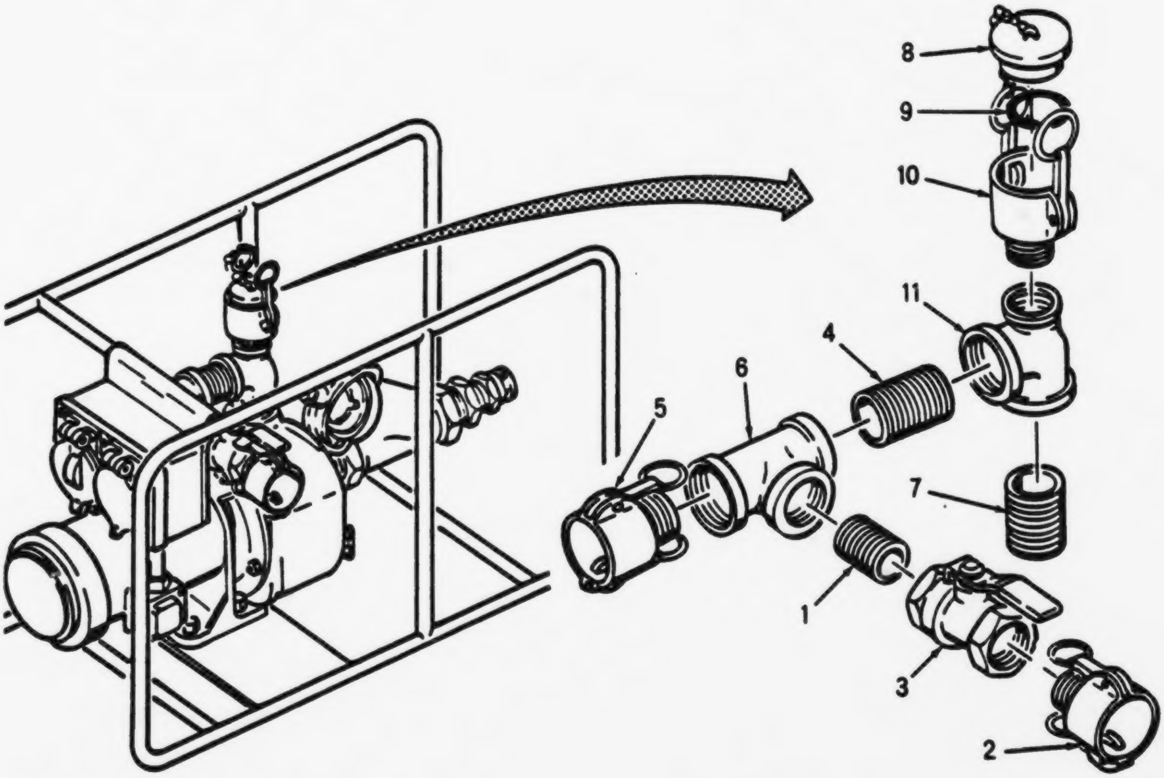
4. Assemble plug (8), gasket (9), half coupling (10), tee (11), and nipple (7).

5. Screw nipple (7) into water pump outlet by turning clockwise.

6. Assembly nipple (4), tee (6) and half coupling (5) and screw nipple (4) into tee (11).

7. Assemble half coupling (2), valve (3), and nipple (1).

8. Screw nipple (1) into tee (6) by turning clockwise.



4-13. WATER PUMP ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

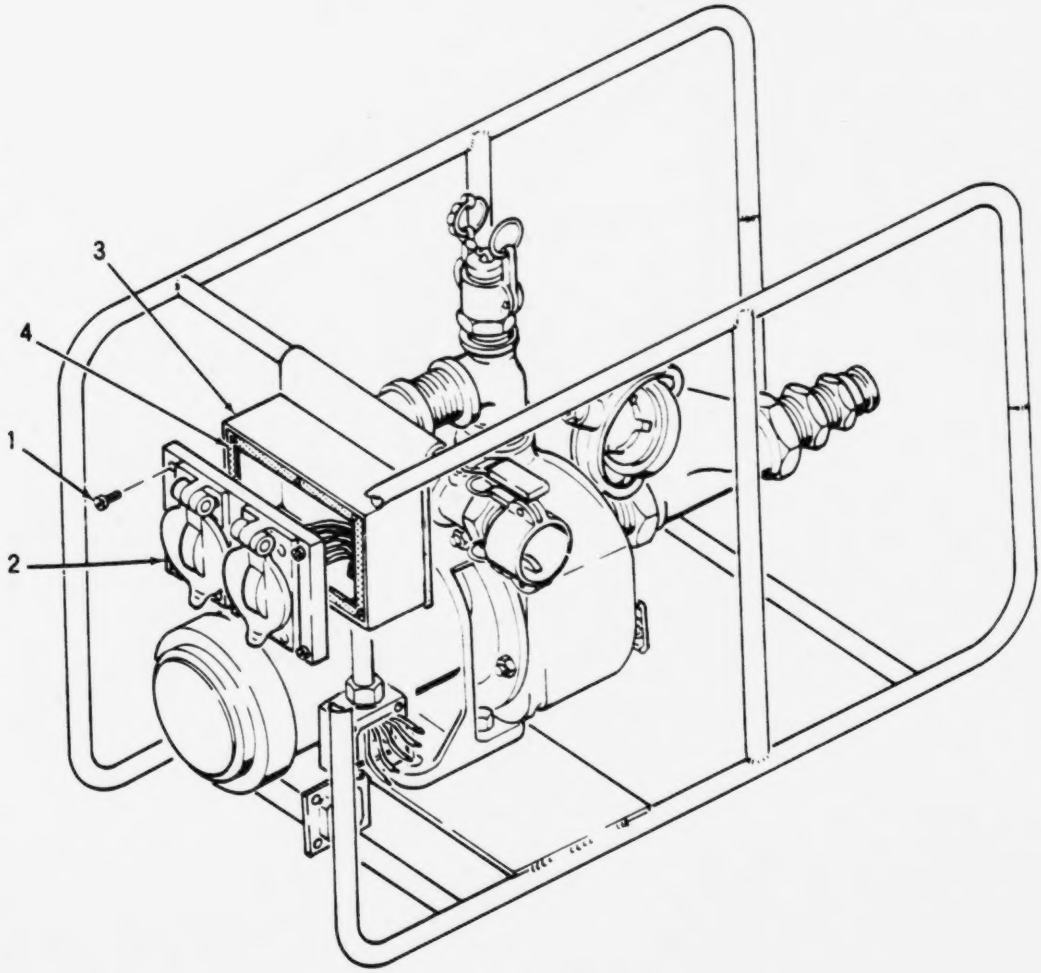
c. Electrical Plug and Limit Switch. Repair the electrical receptacle and limit switch by removing and replacing them. Follow these steps to remove the receptacle and limit switch.

1. Remove four screws (1) securing switch box cover (2) to switch box (3).

CAUTION

Be careful to prevent damage to the gasket.

2. Retain gasket (4).

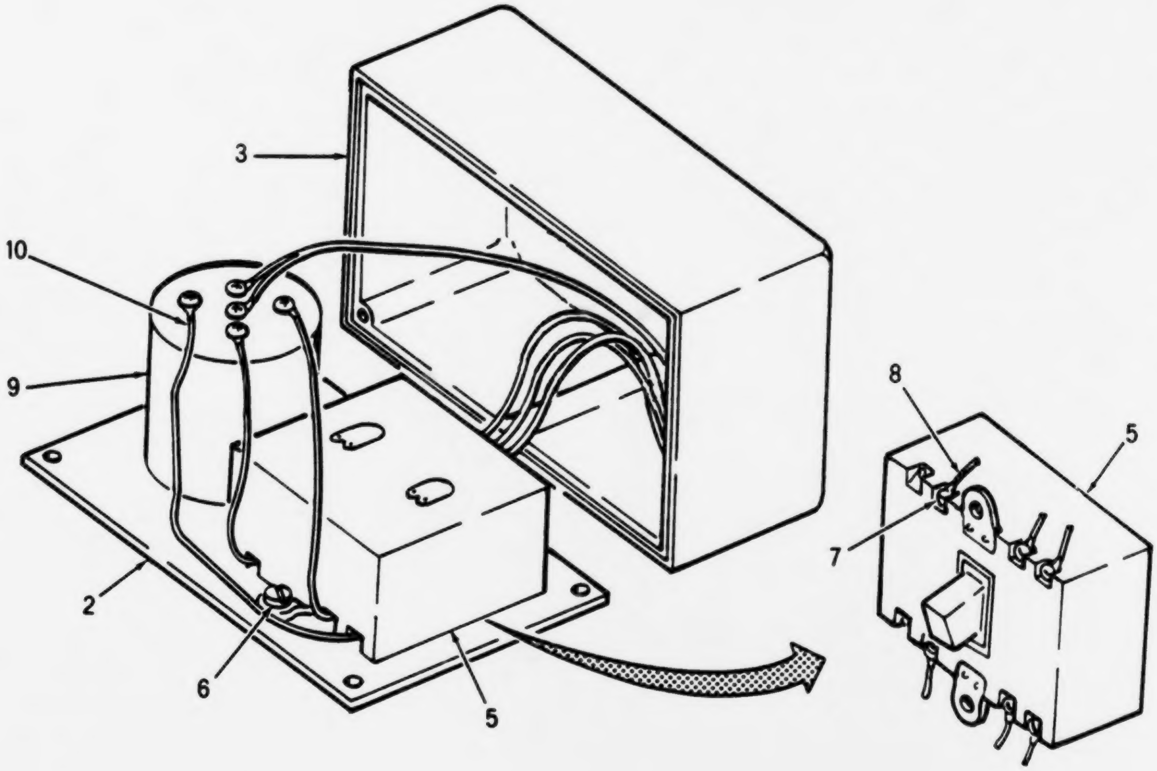


4-13. WATER PUMP ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

c. Electrical Plug and Limit Switch (Cont'd)

3. To remove switch (5), remove two screws (6), six screws (7) and six wires (8). Tag wires.

4. To remove plug (9), remove and tag four wires (10).



4-13. WATER PUMP ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

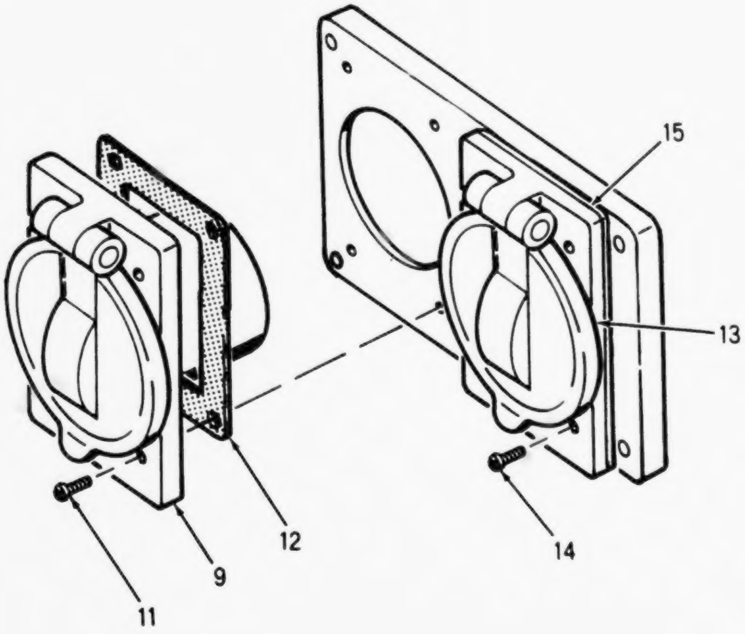
c. Electrical Plug and Limit Switch (Cont'd)

CAUTION

Be careful to prevent damage to the gasket.

5. Remove four screws (11) and remove plug (9) and gasket (12). Retain gasket.

6. To remove switch plate (13), remove four screws (14) and remove plate and gasket (15). Retain gasket.

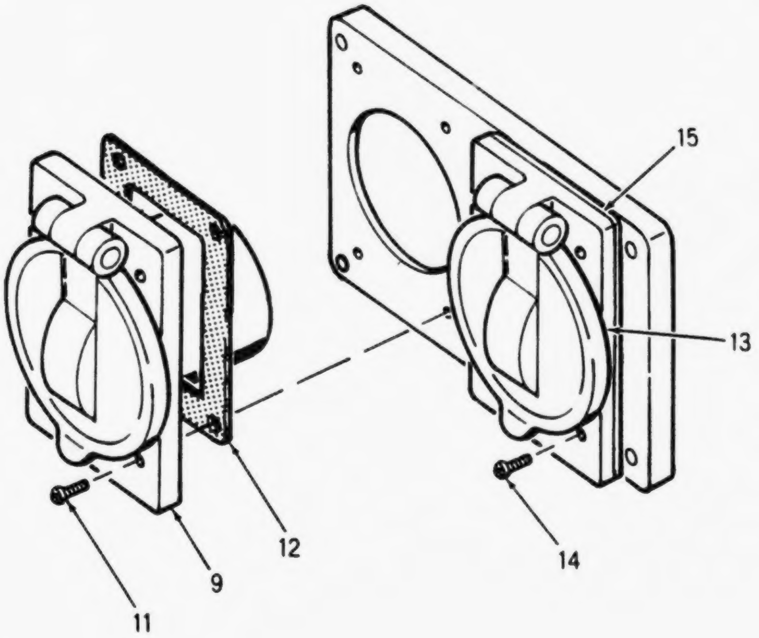


4-13. WATER PUMP ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

c. Electrical Plug and Limit Switch (Cont'd)

8. Install switch plate (13) and gasket (15) and secure with four screws (14).

9. Install plug (9) and gasket (12) and secure with four screws (11).



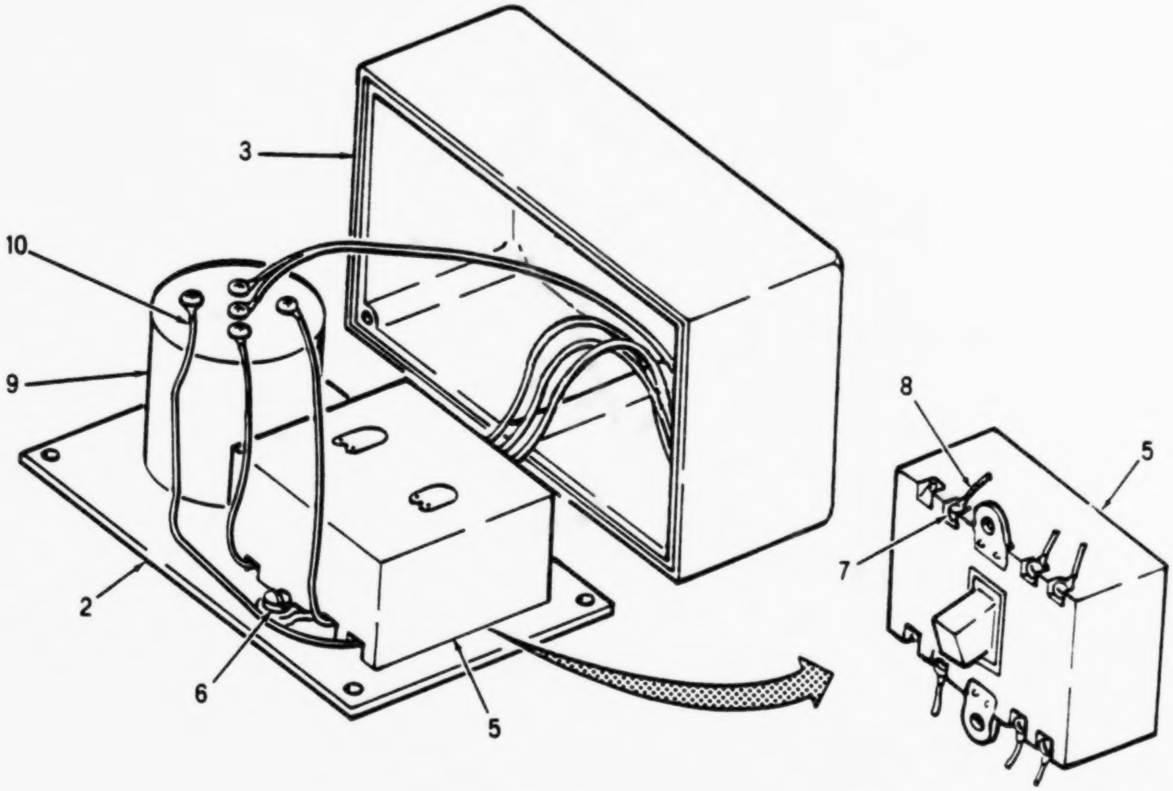
4-13. WATER PUMP ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

c. Electrical Plug and Limit Switch (Cont'd)

10. Attach five tagged wires (10) to plug (9).

11. Attach six tagged wires (8) to switch (5) using six screws (7).

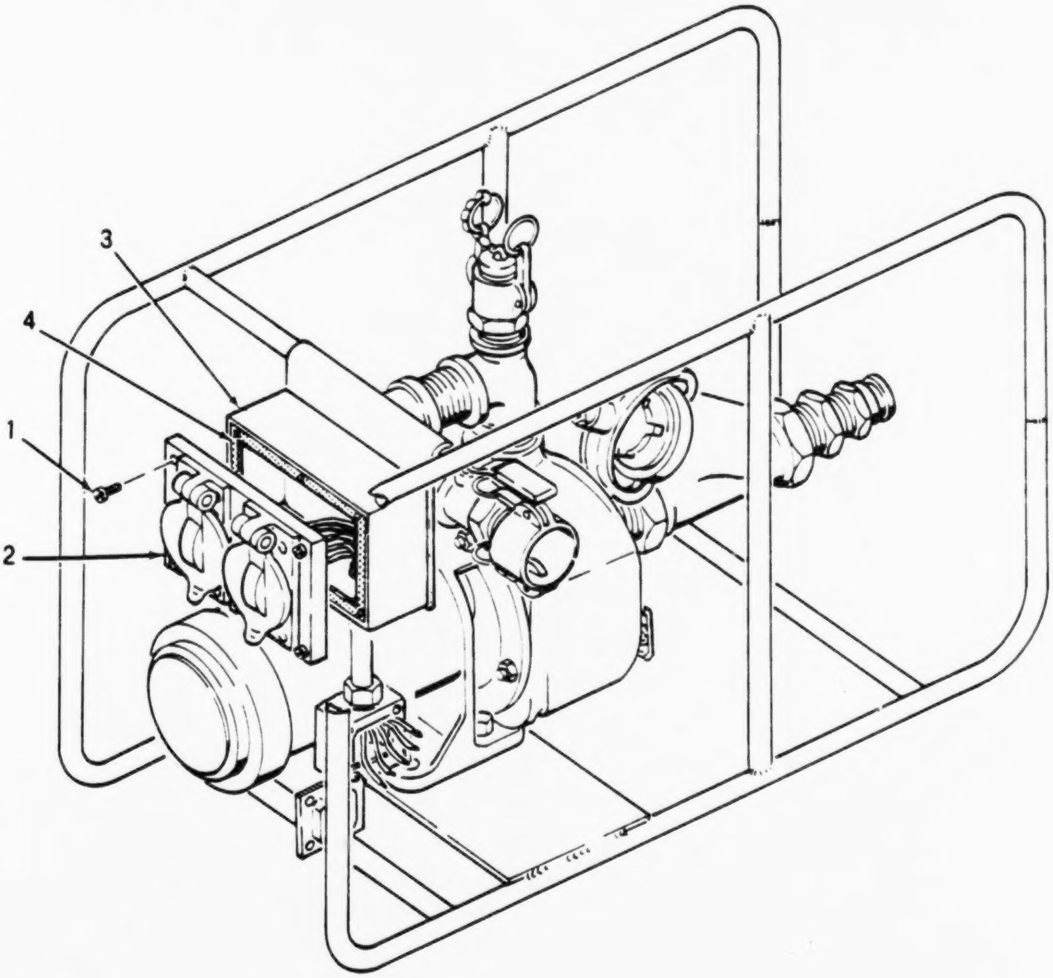
12. Secure switch (5) to switch box cover (2) using two screws (6).



4-13. WATER PUMP ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

c. Electrical Plug and Limit Switch (Cont'd)

13. Install switch box cover (2) and gasket (4) on switch box (3) using six screws (1).

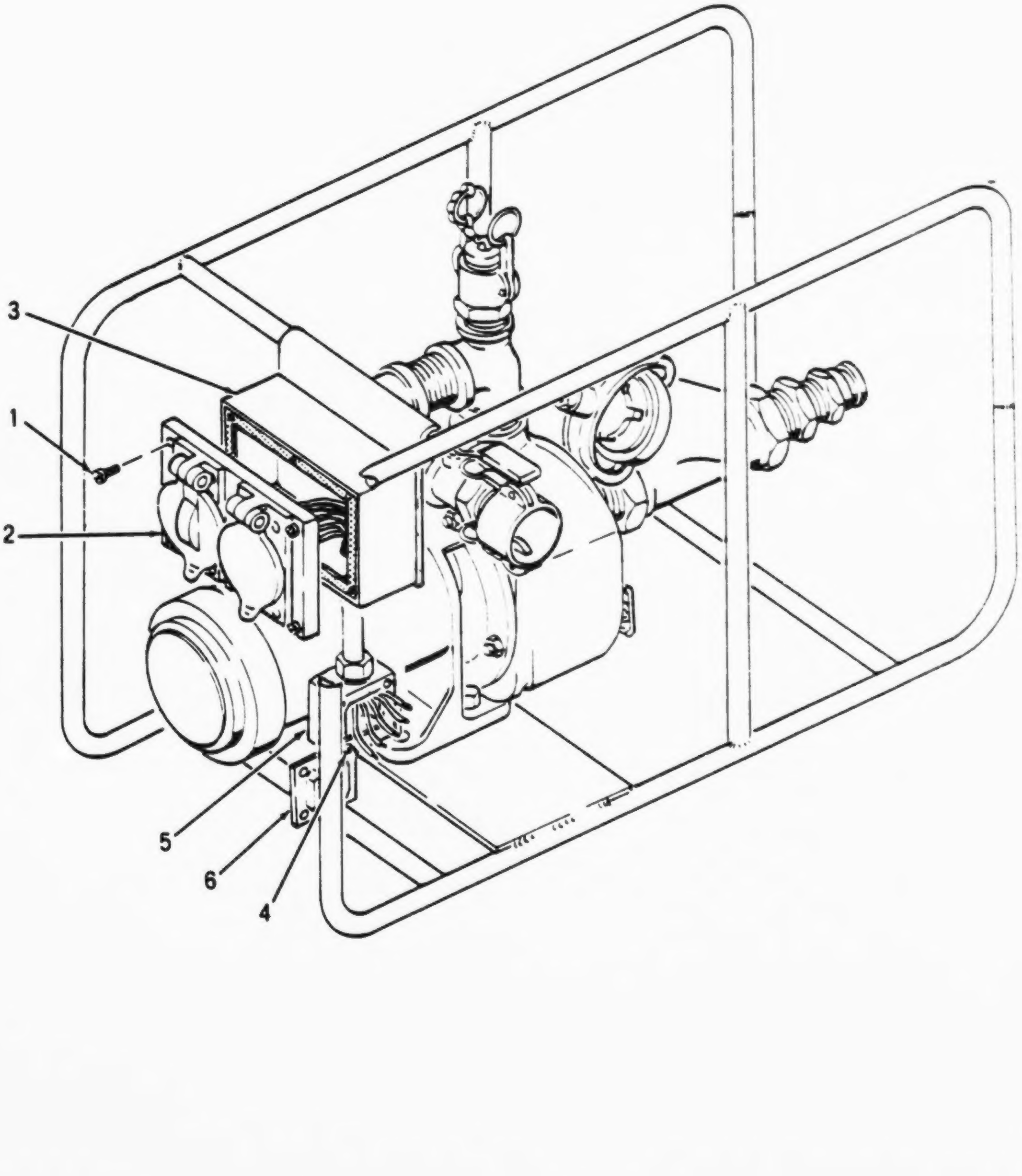


4-13. WATER PUMP ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

d. Electrical Fittings, Conduit, and Wiring. Replace electrical fittings, conduit, or wiring if the defective component renders the water pump inoperative or unsafe to operate. Repair or replace conduit if it is not sealed against moisture. Replace only that component that is defective.

1. To replace one wire or more, remove four screws (1) securing switch box cover (2) to switch box (3).

2. Remove three screws and loosen the fourth screw (4) securing motor power junction box (5) and turn cover plate (6) to expose wires.



4-13. WATER PUMP ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

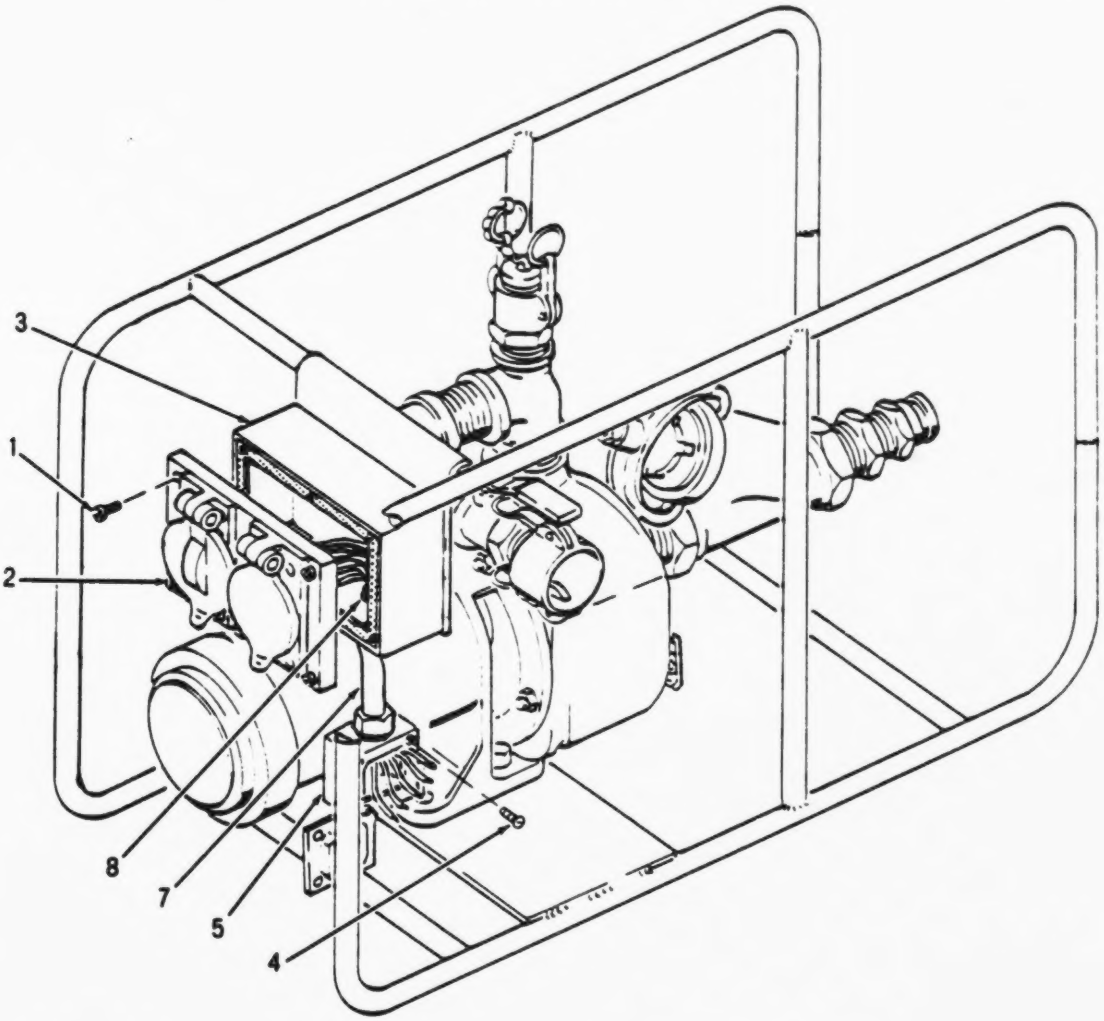
d. Electrical Fittings, Conduit, and Wiring (Cont'd)

3. Disconnect defective wire on limit switch or receptacle (refer to paragraph c.3 and c.4).

4. Disconnect wire nut on same color wire at motor power junction box (5). Remove wire.

5. To remove conduit (7), disconnect and tag all wires in motor power junction box (5) and in switch box (3).

6. Remove locknut (8) on each end of conduit. Bend conduit and lift out. Remove four wires from conduit (7).



4-13. WATER PUMP ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

d. Electrical Fittings, Conduit, and Wiring (Cont'd)

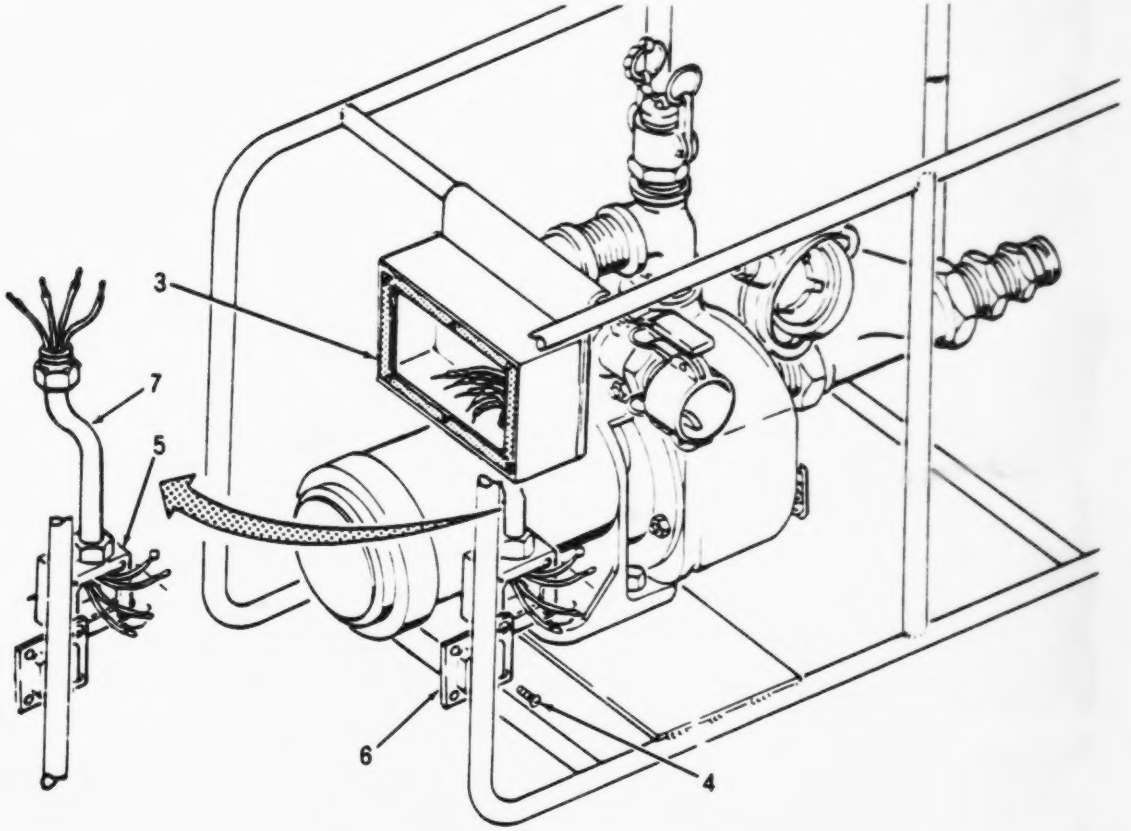
7. Thread four wires through conduit (7) and insert conduit ends into switch box (3) and motor power junction box (5).

8. Install locknuts on each end of conduit (7).

9. Connect tagged wires in switch box (3) and motor power junction box (5).

10. Assemble switch box limit switch and switch box (paragraph c.).

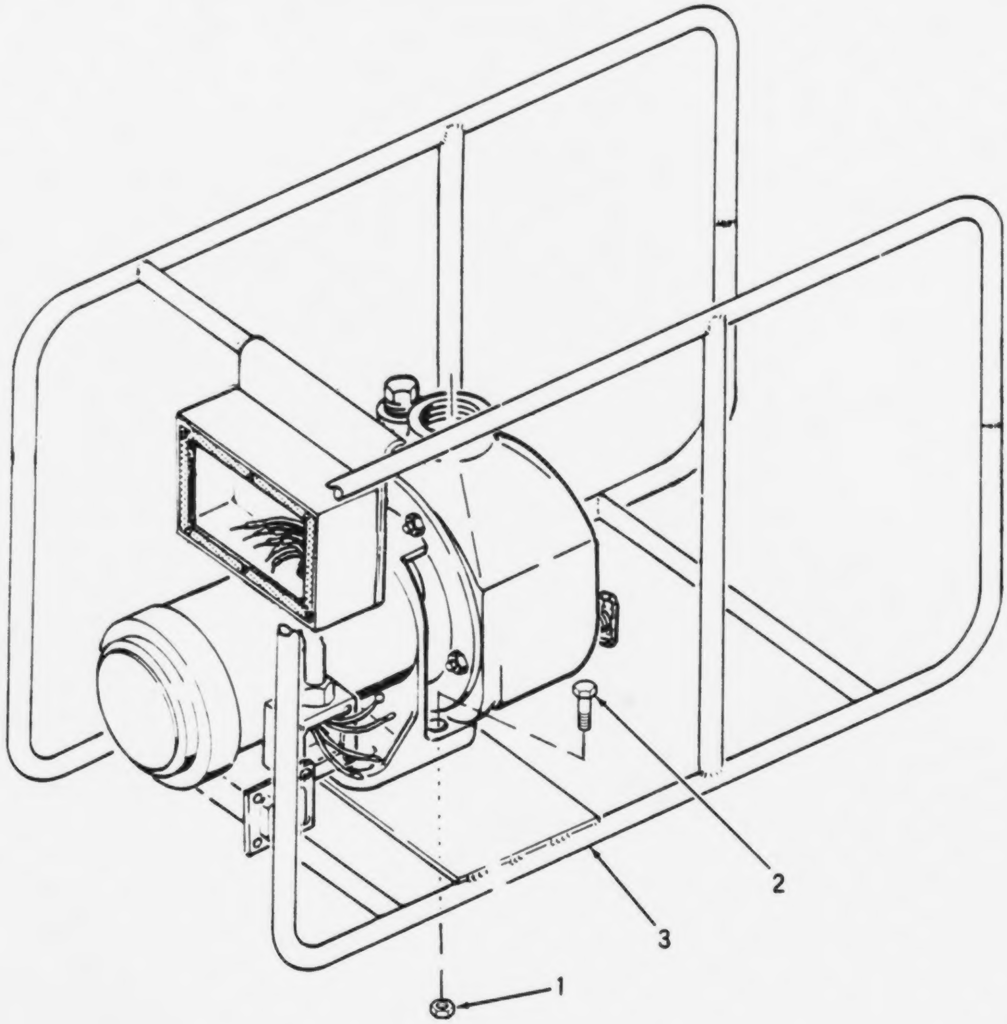
11. Set motor power junction box cover (6) in place and secure with four screws (4).



4-13. WATER PUMP ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

e. Water Pump and Motor. The motor is an integral part of the water pump making it necessary to replace both assemblies if a defect occurs to either assembly. Proceed as follows.

1. Disconnect wires in motor power junction box (paragraph d).
2. Disconnect conduit at motor power junction box (paragraph d).
3. Remove inlet water strainer (paragraph a).
4. Remove water outlet assembly (paragraph b).
5. Remove four nuts (1) and four screws (2) and remove water pump assembly from frame (3).



4-13. WATER PUMP ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

e. Water Pump and Motor (Cont'd)

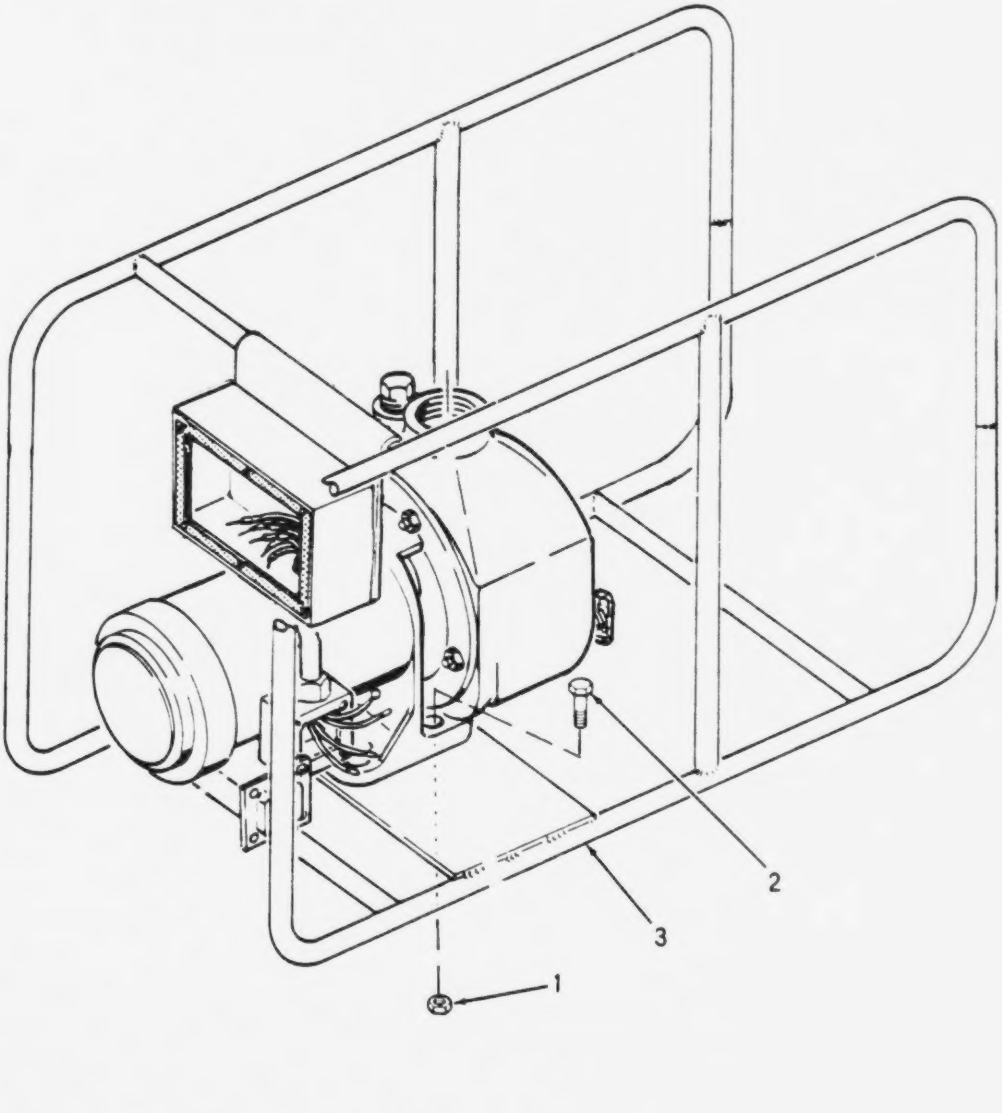
6. Install water pump assembly by setting in place, and installing four screws (2) and four nuts (1).

7. Install water outlet assembly (paragraph b).

8. Install inlet water strainer (paragraph a).

9. Connect conduit to motor power junction box (paragraph d).

10. Connect wires in motor power junction box (paragraph d).



4-13. WATER PUMP ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

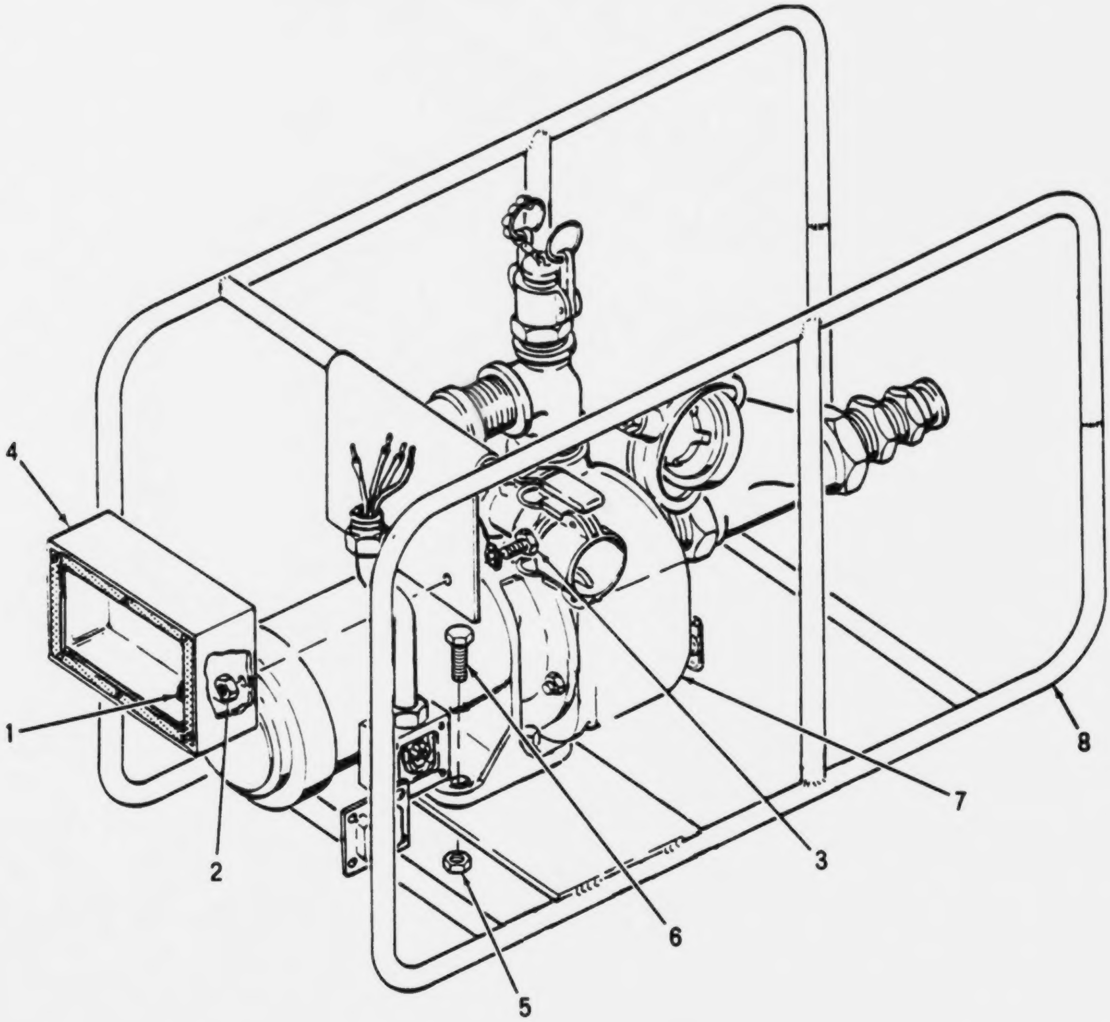
f. Water Pump Frame. Replace the water pump frame if badly bent or broken.

1. Remove switch box cover and disconnect wires to limit switch and ground from plug (paragraph c).

2. Remove locknut (1) securing conduit to switch box.

3. Remove two nuts (2) and two screws (3) and remove switch box (4).

4. Remove four nuts (5) and four screws (6) and remove water pump assembly (7) from frame (8).



4-13. WATER PUMP ASSEMBLY MAINTENANCE PROCEDURES (CONT'D)

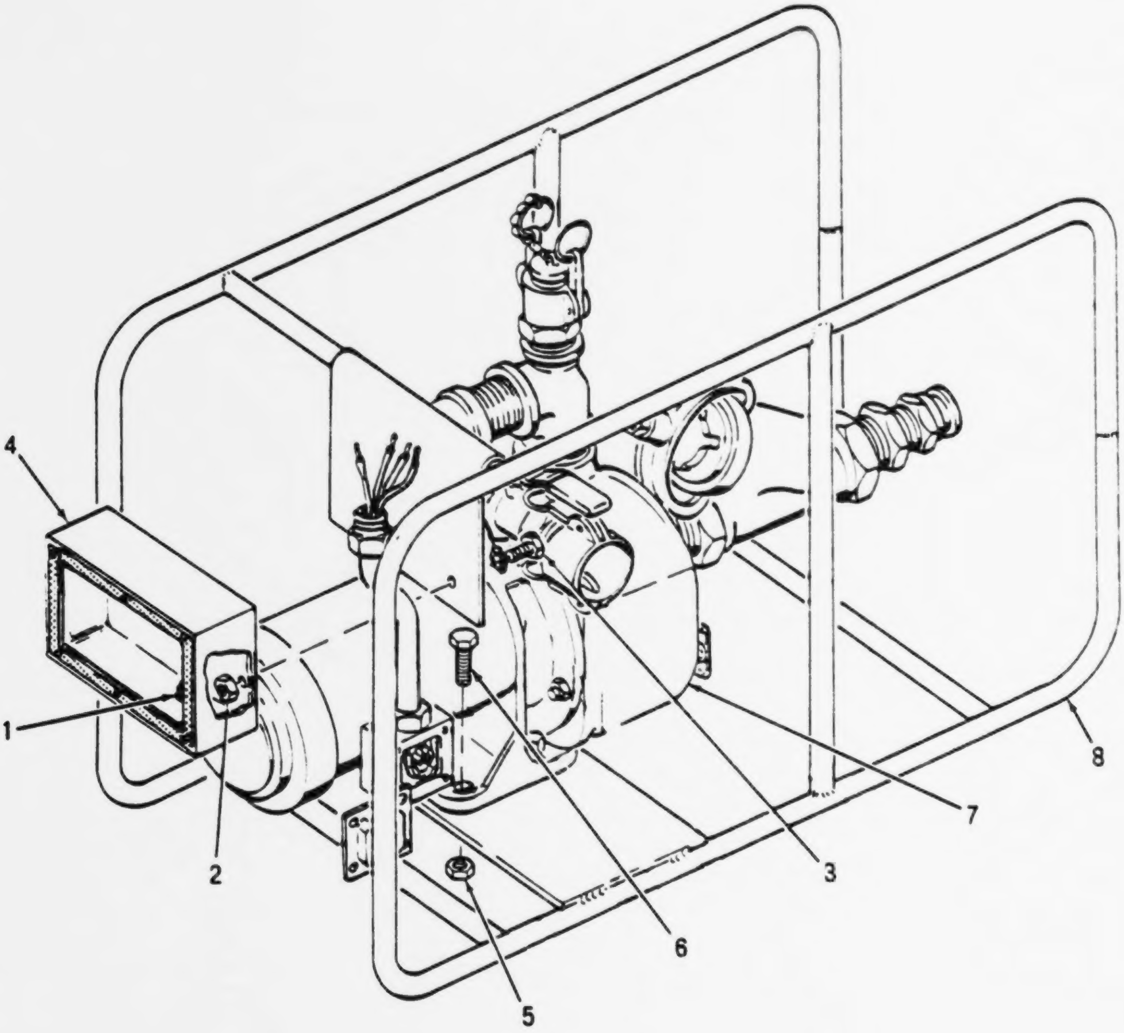
f. Water Pump Frame (Cont'd)

5. Install water pump assembly in frame by setting in place and secure with four screws (6) and four nuts (5).

6. Mount switch box (4) using two screws (3) and two nuts (2).

7. Secure conduit to switch box using locknut (1).

8. Connect wires to limit switch and ground to plug and install switch box cover (paragraph c).



4-14. WATER HEATER MAINTENANCE PROCEDURES

Water heater maintenance procedures restores the unit to normal operating condition by replacing the defective component and making necessary adjustments. After replacing the defective component ensure that the water heater is operating normally by making a visual inspection or performing an operational check.

a. Fuel Supply Control Assembly. The fuel supply control assembly includes, fuel shut-off valve, solenoid valve, fuel pressure gage and fuel lines and fittings. Inspect the control assembly for cracks or loose fitting components that cause leaks. Tighten loose fittings and check for leaks. Replace badly bent or broken components. After replacement, check system under pressure to ensure no fuel leaks are present. Remove and replace only those items necessary to make repair.

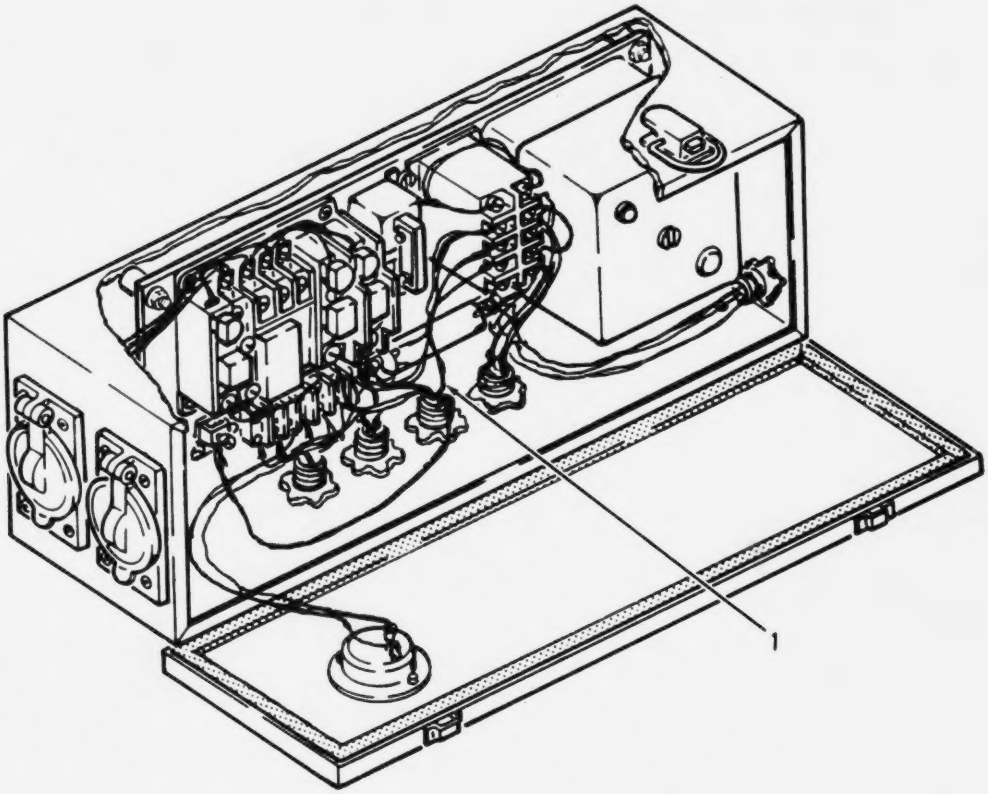
NOTE

To remove components of the fuel supply control assembly, the control assembly must be removed from the mounting on the water heater skid.

4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

a. Fuel Supply Control Assembly (Cont'd)

1. At master control box, tag and disconnect yellow and white wires (1).



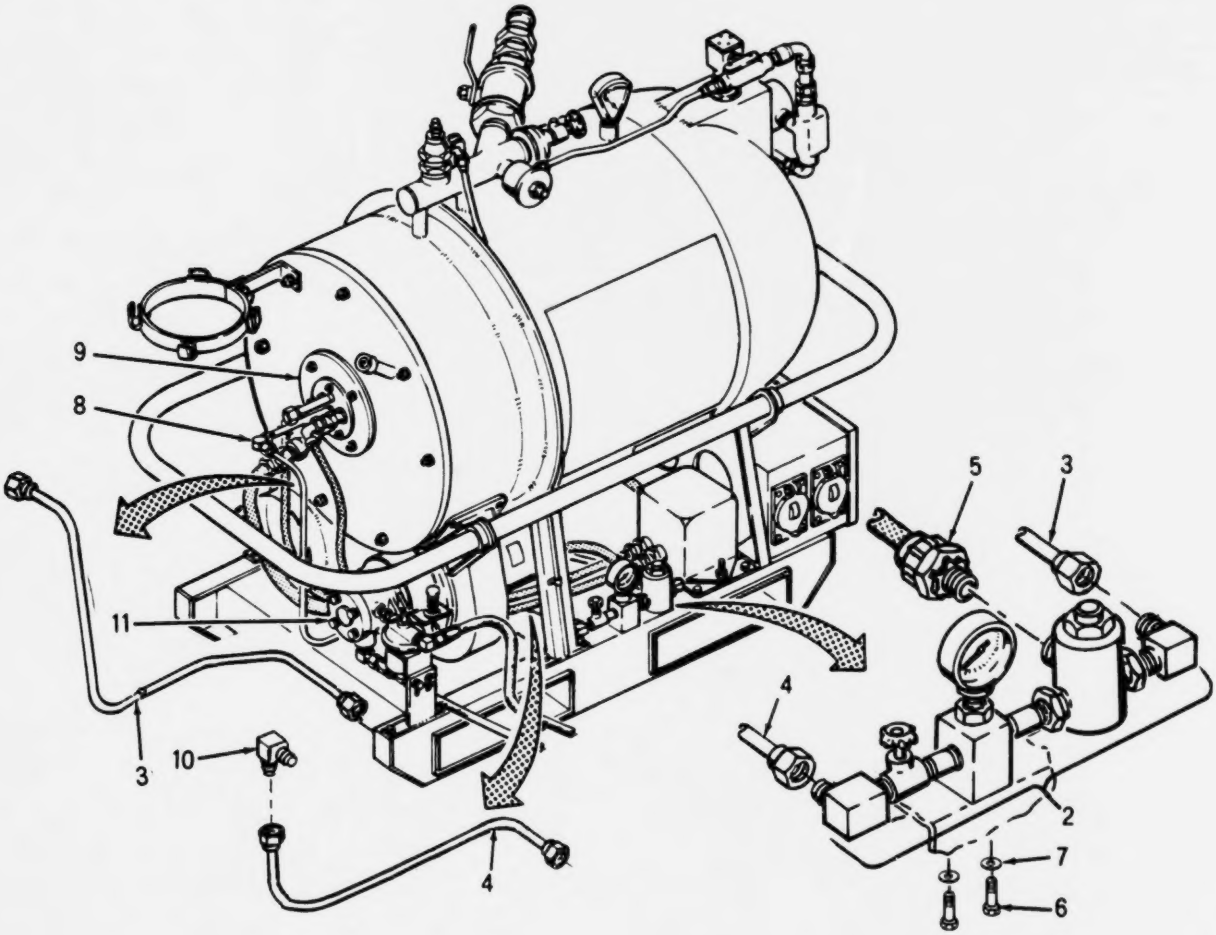
4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

a. Fuel Supply Control Assembly (Cont'd)

2. To remove fuel supply control assembly (2), disconnect fuel line couplings (3 and 4), disconnect coupling (5), remove two screws (6) and two washers (7). Remove fuel supply control assembly by pulling fuel solenoid wires out of conduit (5).

3. To disconnect fuel line (3), disconnect coupling at adapter (8) and remove fuel line. Unscrew adapter (8) from burner head (9).

4. To disconnect fuel line (4), disconnect coupling at elbow (10). Unscrew elbow (10) from fuel pump (11).



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

a. Fuel Supply Control Assembly (Cont'd)

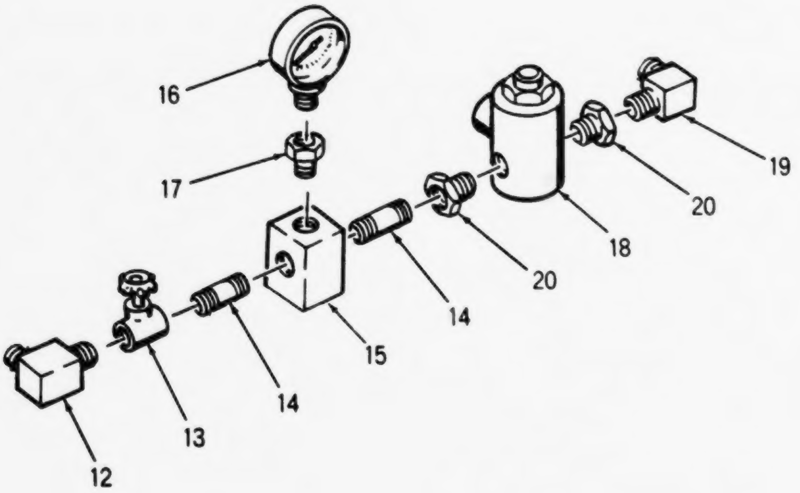
5. To remove control valve (13), unscrew elbow (12) and unscrew valve from nipple (14).

6. To remove fuel line tee (15), repeat steps 5, 6, and 7 if necessary, unscrew two nipples (14).

7. To remove gage (16), unscrew gage from snubber (17).

8. To remove solenoid valve (18) unscrew elbow (19), two reducers (20), and unscrew solenoid valve.

9. Inspect components for damaged threads, and broken gage. Replace defective component.



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

a. Fuel Supply Control Assembly (Cont'd)

WARNING

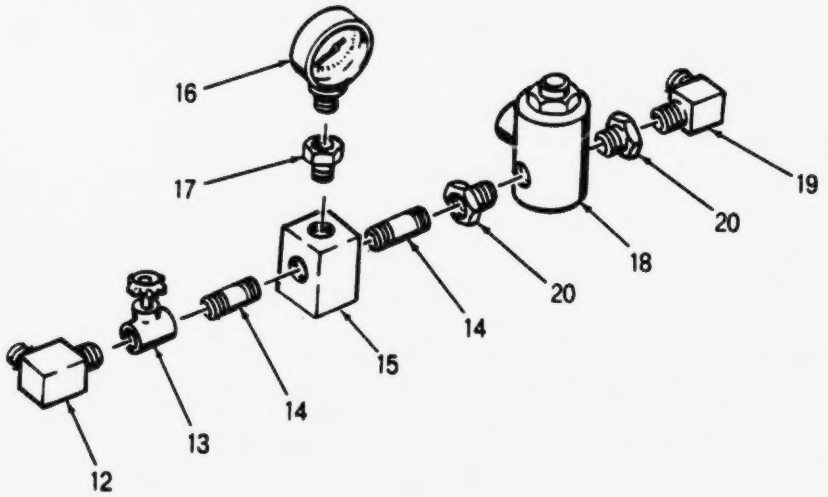
Drycleaning solvent, (4, Appendix E) is potentially dangerous. Avoid repeated or prolonged breathing of vapors and skin contact with liquid. Do not use near open flame, arcing equipment, or other ignition sources. Use in well ventilated places.

10. Clean all used components and fittings with solvent (4, Appendix E).

NOTE

Use pipe joint compound (14, Appendix E) when joining pipes and fittings.

11. Install two nipples (14) and snubber (17) in fuel line tee (15) by turning clockwise.
12. Install gage (16) in snubber (17) by turning clockwise.
13. Attach control valve (13) to nipple (14) by turning clockwise.
14. Install elbow (12) to control valve (13) by turning clockwise.
15. Install two reducers (20) in solenoid valve (18) and install assembled components to nipple (14). Install elbow (19) to reducer (20).



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

a. Fuel Supply Control Assembly (Cont'd)

16. Insert fuel solenoid valve wires in conduit and install fuel supply control assembly (2) to water heater skid using two screws (6) and two washers (7). Tighten screws.

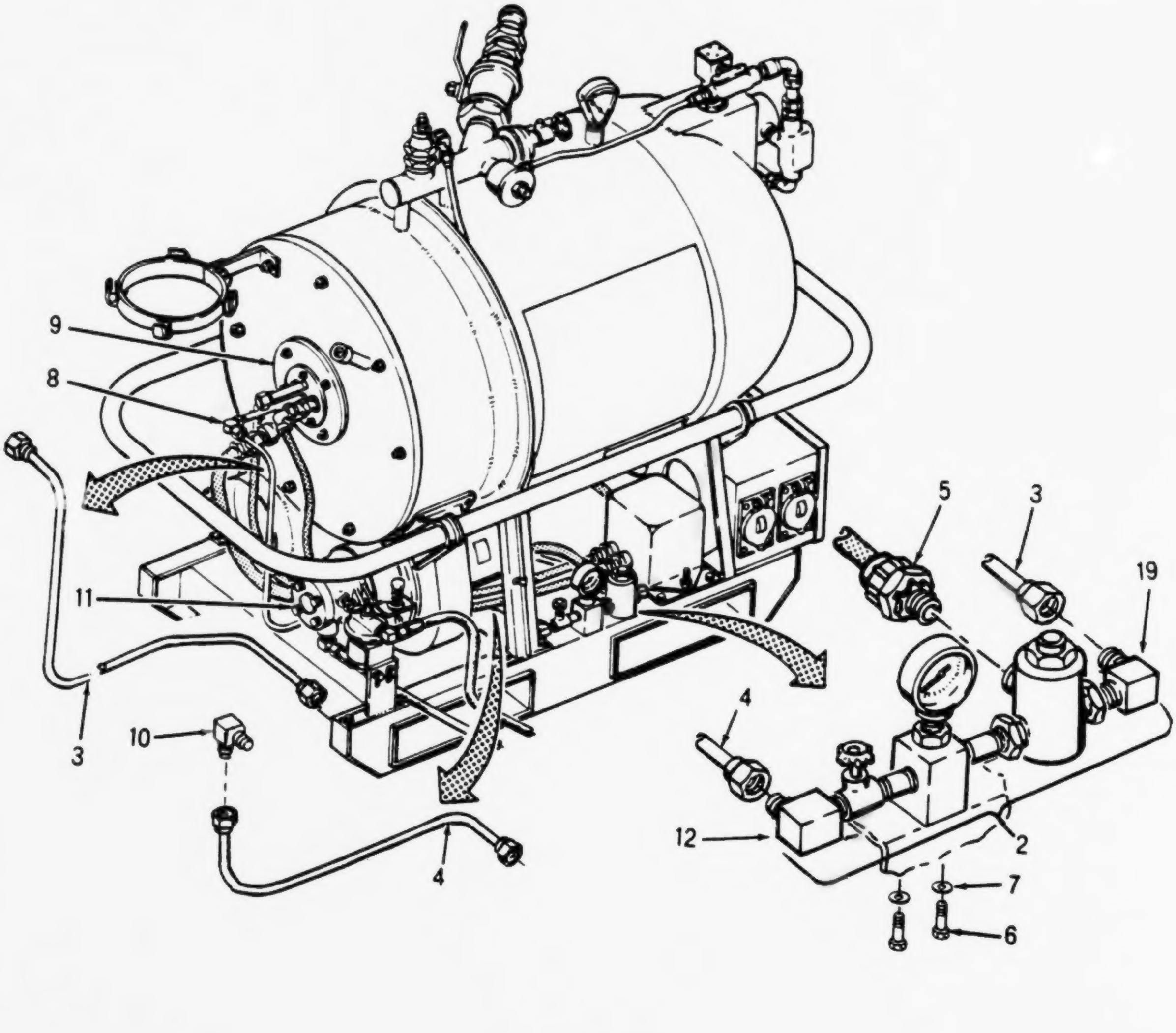
17. Connect conduit coupling (5) to solenoid valve (18).

18. Connect elbow (10) to fuel pump (11).

19. Connect fuel line (4) to elbow (10) and other end to elbow (12) on fuel supply control assembly (2).

20. Connect adapter (8) to burner head (9).

21. Connect fuel line (3) to adapter (8) and to elbow (19) on fuel supply control assembly. Tighten all couplings.

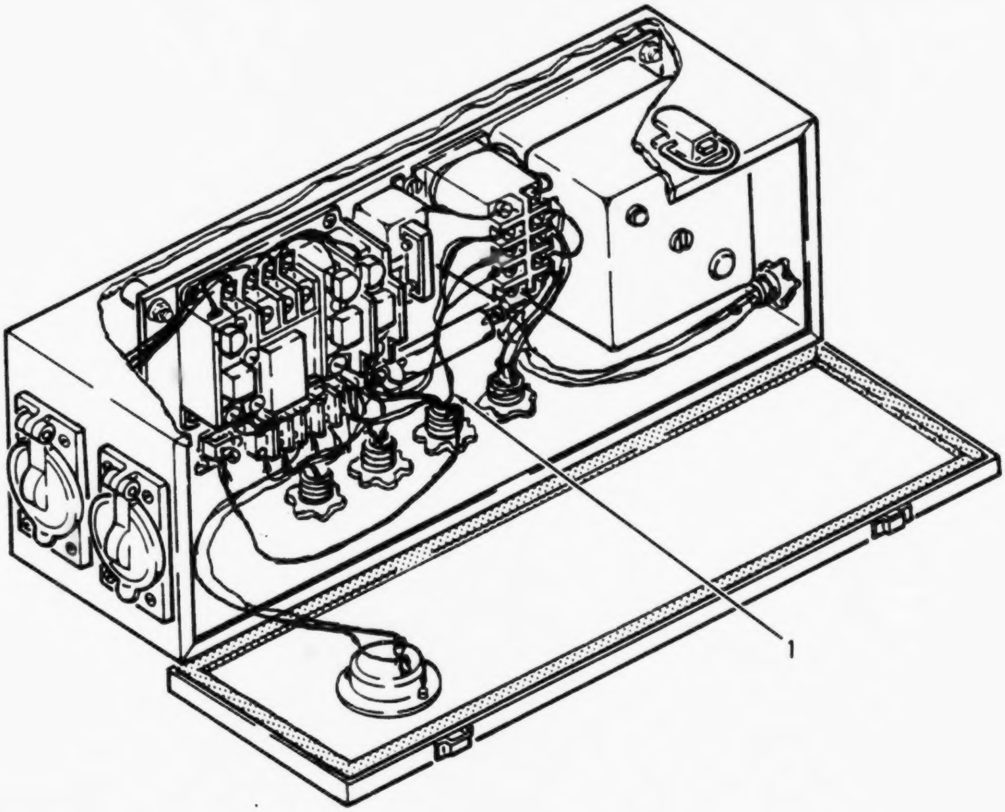


4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

a. Fuel Supply Control Assembly (Cont'd)

22. At master control box connect yellow and white wires disconnected in step 1.

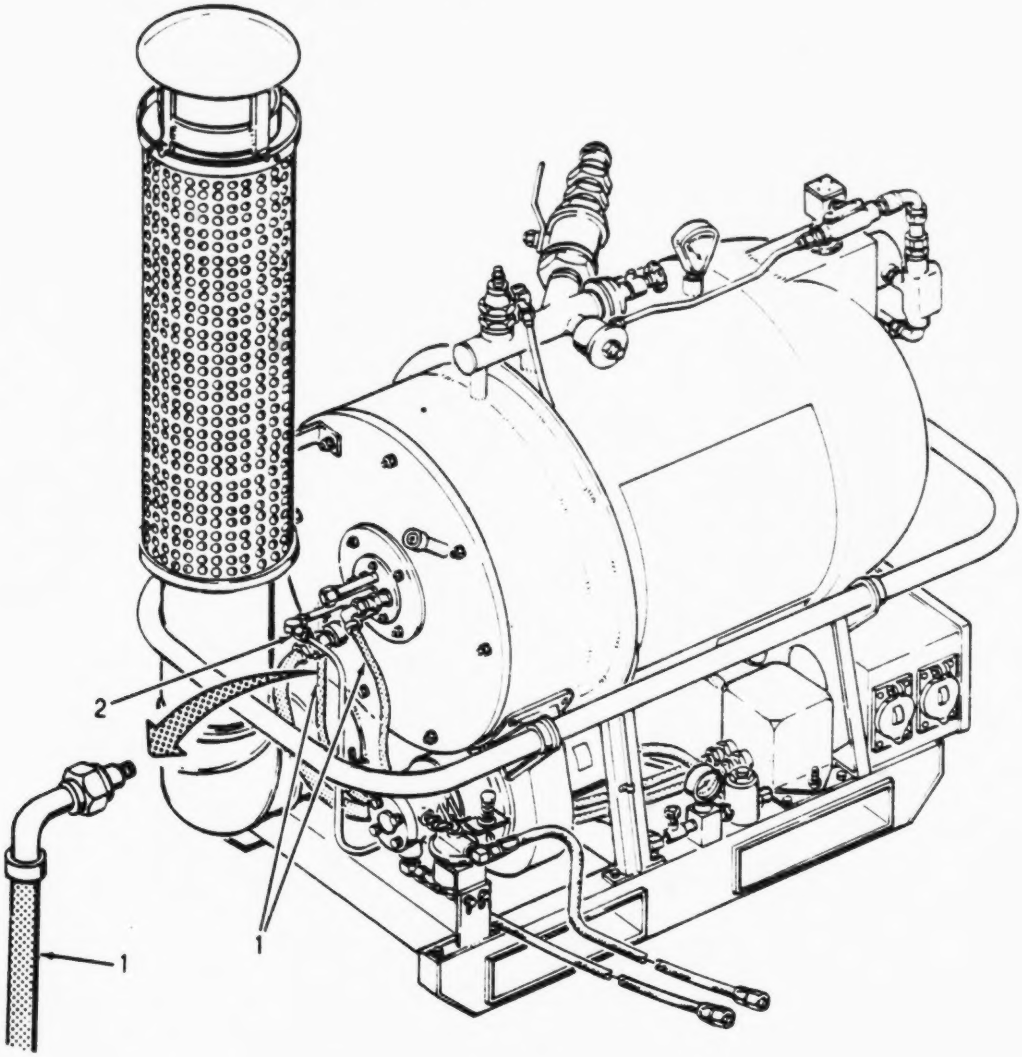
23. Perform setup procedures (paragraph 2-7), preparation for use (paragraph 2-8) and start up procedures (paragrpah 2-9) to ensure normal operation of water heater.



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

b. Burner Head Assembly. Burner head assembly maintenance consists of removal, inspection of burned or defective components, cleaning, replacement and installation of defective conponents. After installation, the burner head will be tested to ensure normal operation.

1. Disconnect two ignition cable assemblies (1) and fuel line (2).



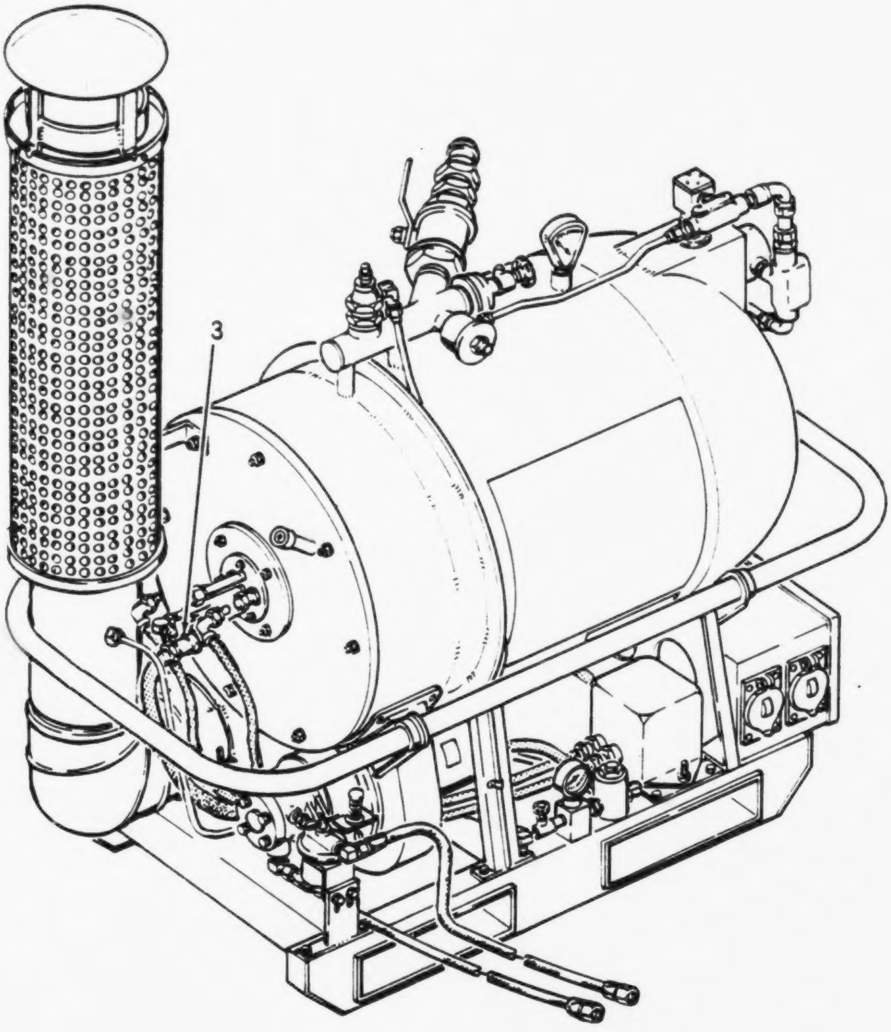
4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

b. Burner Head Assembly (Cont'd)

CAUTION

The scanner is a sensitive device. Rough handling can damage the scanner and result in possible failure of the flame safeguard control.

2. Disconnect scanner (3).



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

b. Burner Head Assembly (Cont'd)

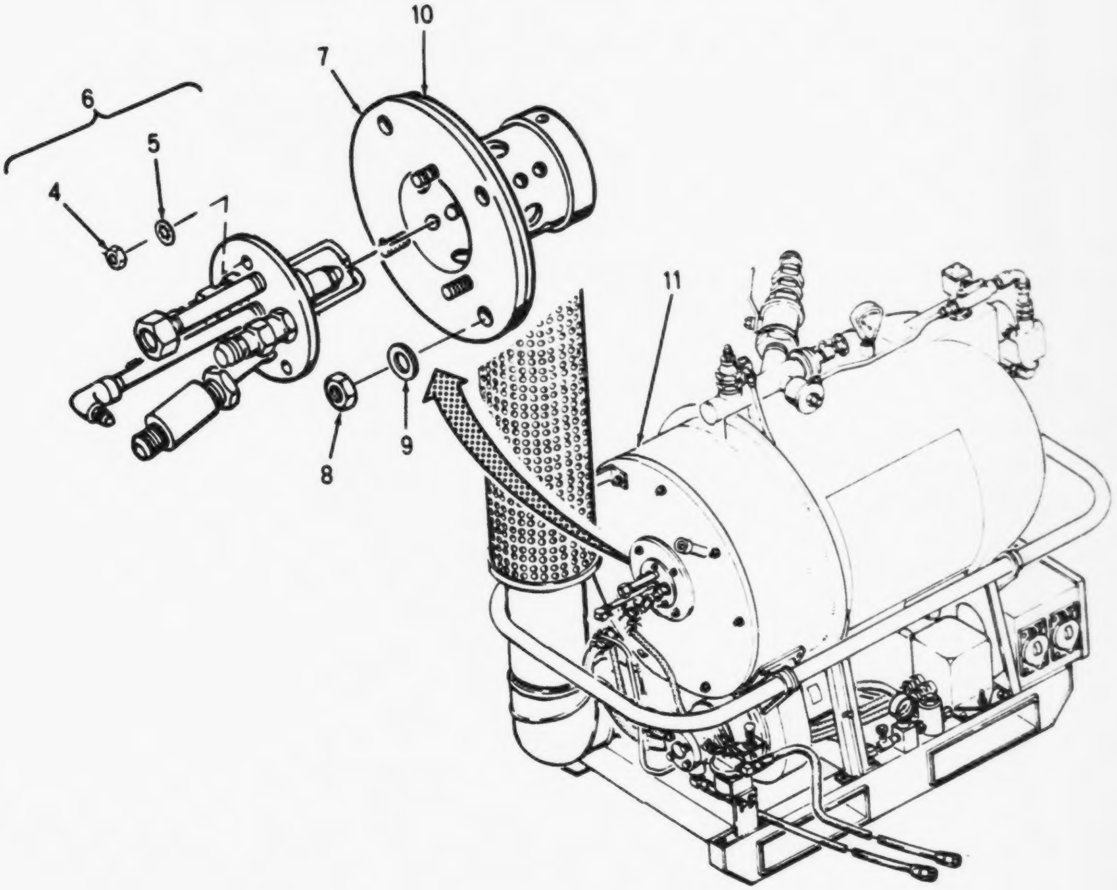
3. Remove three nuts (4) and three washers (5) and remove nozzle and electrode assembly (6) from burner tube (7).

4. Inspect inside of burner tube (7) for excessive damage.

NOTE

Do not remove the burner tube unless it is necessary.

5. Remove four nuts (8) and four washers (9) and remove burner tube (7) and gasket (10) from water heater (11).



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

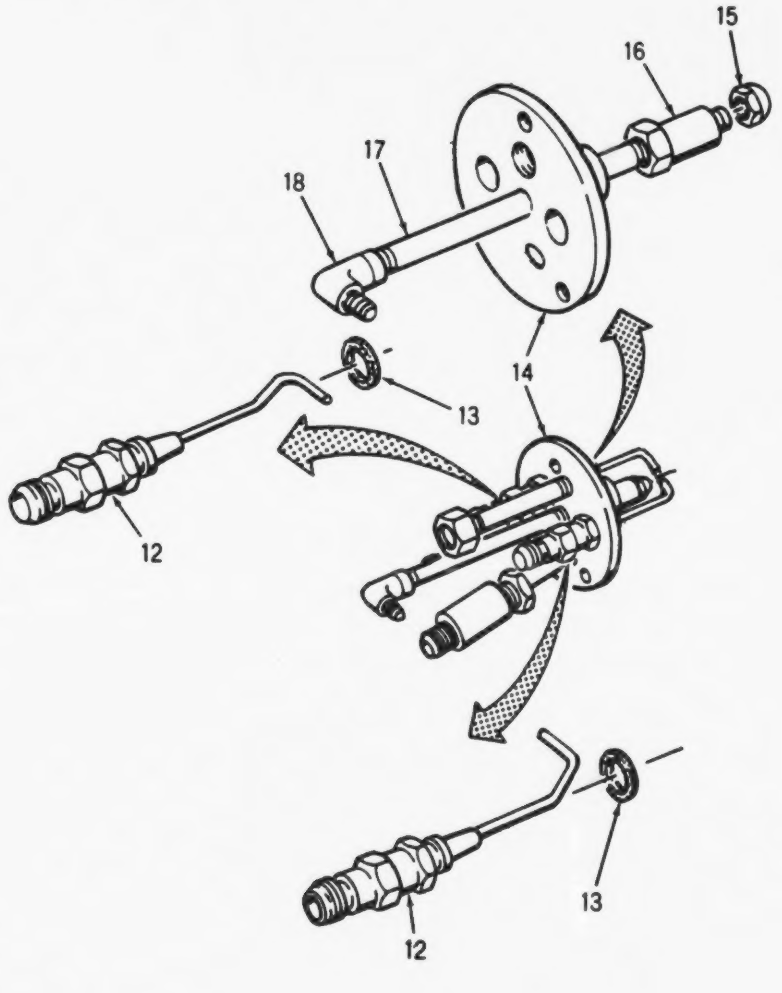
b. Burner Head Assembly (Cont'd)

6. Unscrew and remove spark plugs (12) with gaskets (13) from nozzle and electrode holder (14).

7. Unscrew and remove nozzle (15) and adapter (16) attached to nipple (17).

8. Mark position of nipple (17) with holder (14) before removing to ensure proper position during installation.

9. Remove nipple (17). Remove elbow (18) from nipple.



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

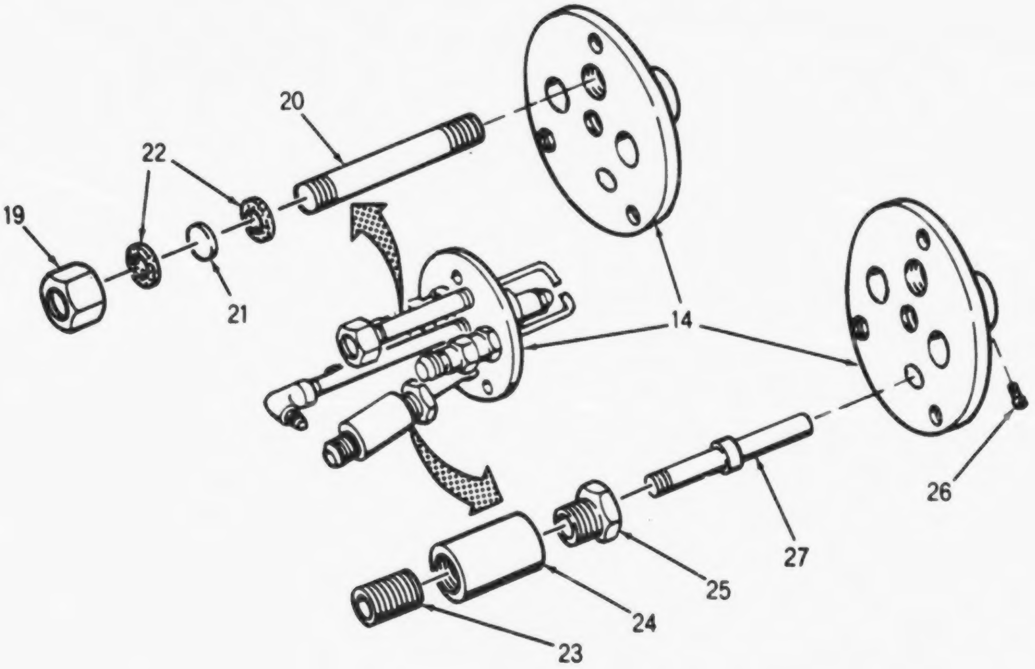
b. Burner Head Assembly (Cont'd)

10. Unscrew and remove ignition sight tube (19 through 22) from holder (14).

CAUTION

Hold peep sight over table to prevent dropping glass to floor.

11. Unscrew and remove peep sight cap (19) from nipple (20).
12. Remove peep sight glass (21) and two peep sight gaskets (22). Separate gaskets from glass.
13. Unscrew and remove close nipple (23) from coupling (24).
14. Unscrew and remove coupling (24) from bushing (25).
15. Loosen setscrew (26) securing scanner tube (27) to holder (14) and slip tube from holder.
16. Unscrew and remove bushing (25) from scanner tube (27).



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

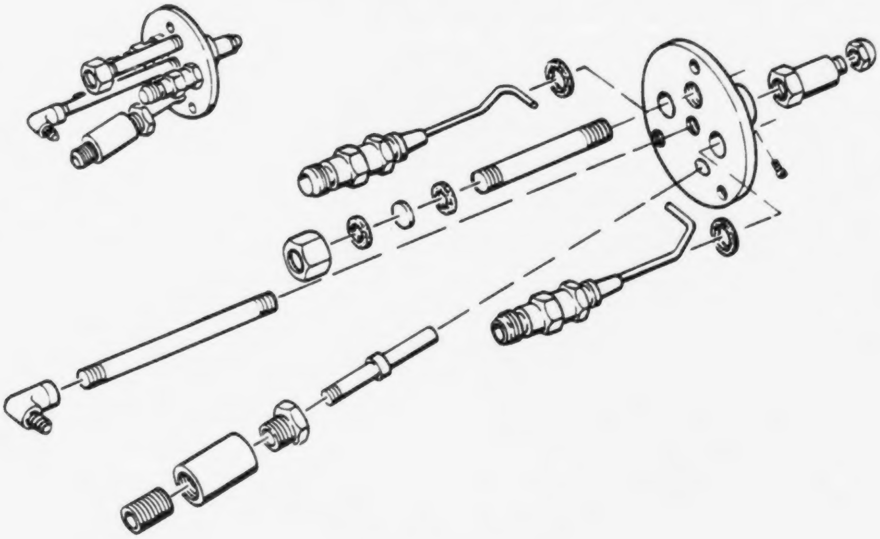
b. Burner Head Assembly (Cont'd)

17. Inspect for broken, cracked, and distorted holder and for damaged threads. Inspect spark plug electrodes for burned spots, and inspect insulation for cracks, breaks, and lines (etchings). Check for broken or distorted gaskets.

18. Inspect for clogged, cracked, and excessively worn nozzle. Inspect nozzle for carbon deposits, and adapter for damaged threads. Inspect nipple and elbow for damaged threads.

19. Inspect for broken or cracked sight glass, stripped or damaged threads on the cap, and leaking gaskets. Inspect sight tube for damaged threads.

20. Inspect scanner tube, bushing, coupling and close nipple for damaged threads. Inspect for clogged or obstructed tube.



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

b. Burner Head Assembly (Cont'd)

21. Wash spark plug electrodes with soapy water, rinse in clean water, and dry thoroughly.

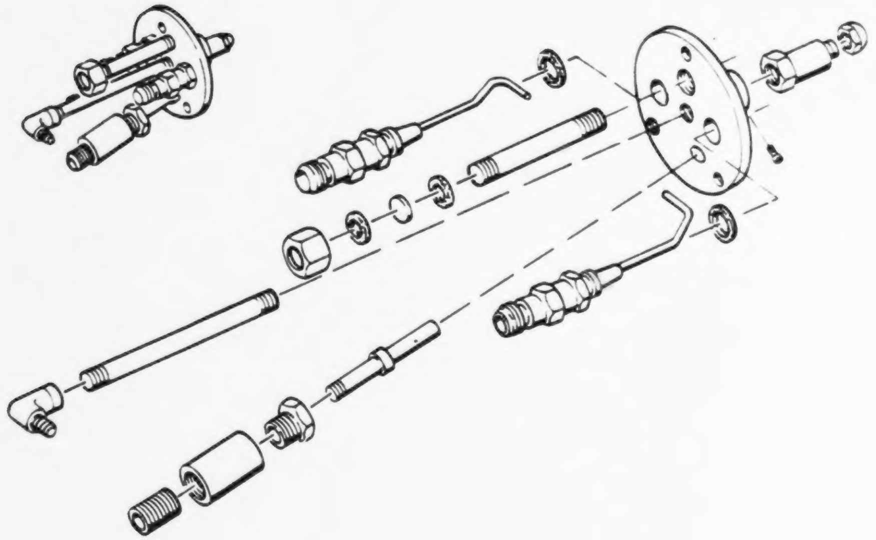
CAUTION

Use extreme care when cleaning nozzle to avoid damaging orifice tip. Do not force wire or any metallic object through nozzle orifice.

22. Wash nozzle and adapter in solvent (14, Appendix E). Scrub nozzle with small brush. Dry all parts thoroughly.

23. Wash sight glass in soapy water, rinse in clean water and dry thoroughly.

24. Wash scanner tube in solvent (14, Appendix E) to remove deposits in tube and dry thoroughly.



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

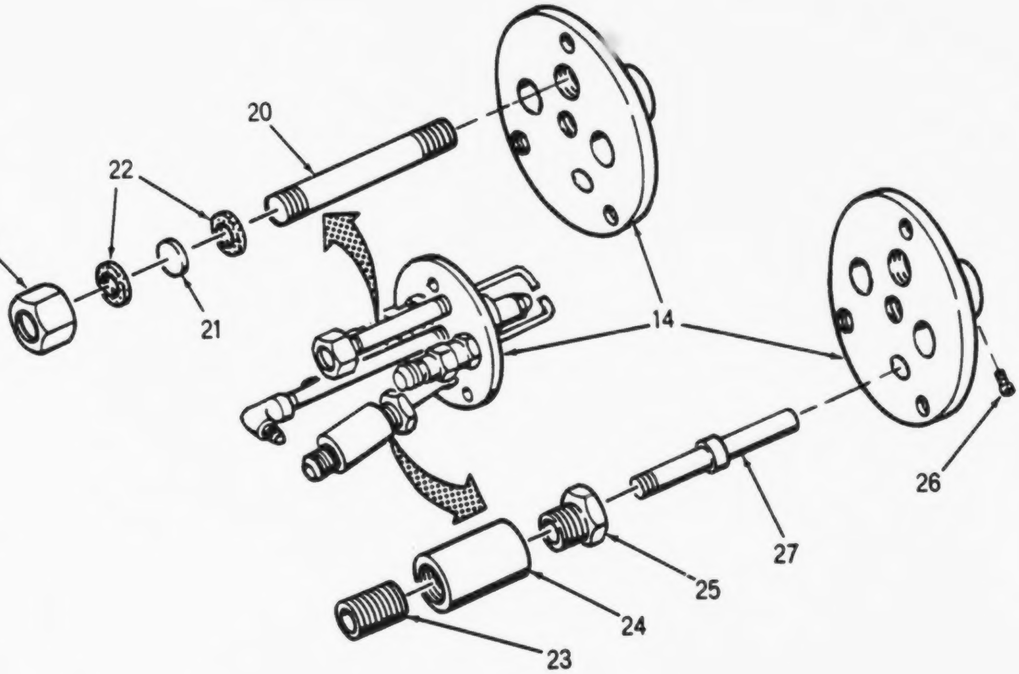
b. Burner Head Assembly (Cont'd)

25. Screw close nipple (23) and bushing (25) into coupling (26) by turning clockwise.

26. Screw scanner tube (27) into bushing (25). Insert scanner tube (27) into holder (14) and tighten setscrew (26).

27. Assemble two gaskets (22) and peep sight glass (21) and attach to nipple (20) with peep sight cap (19).

28. Install nipple (20) in holder (14) by turning clockwise.



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

b. Burner Head Assembly (Cont'd)

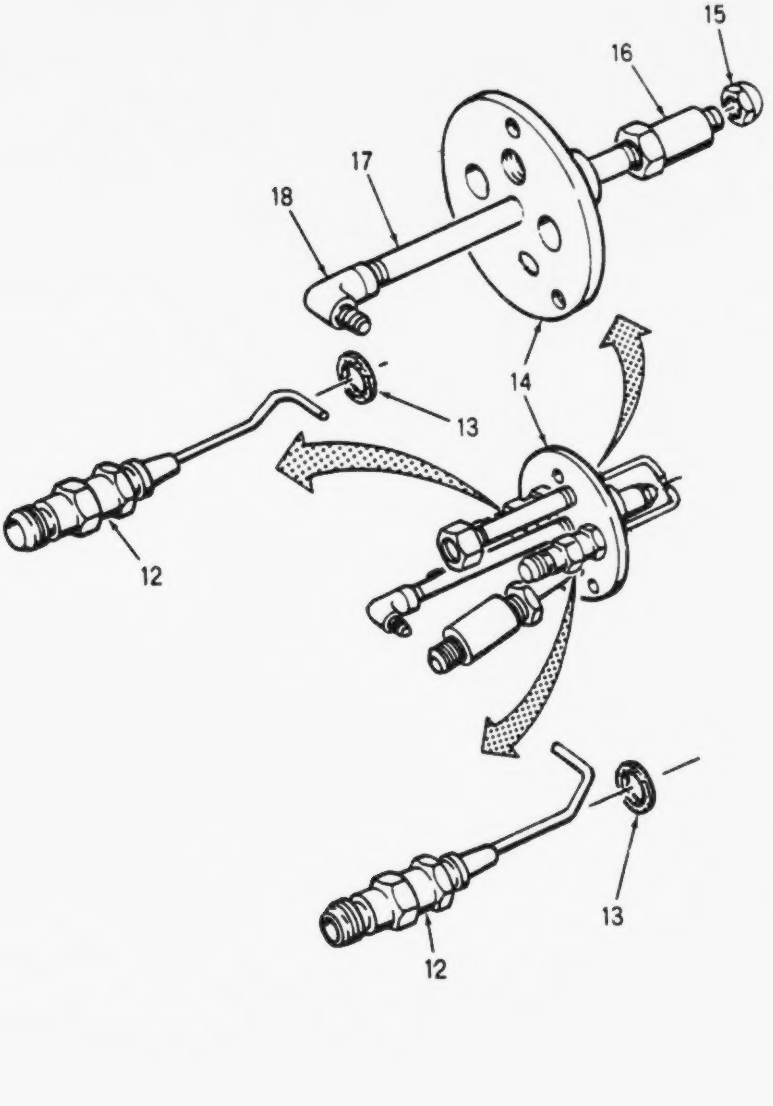
29. Install elbow (18) on nipple (17) and screw into holder (14).

30. Screw nozzle adapter (16) to end of nipple (17) and install nozzle (15) to nozzle adapter (16).

NOTE

Spark plugs are designated left handed and right handed. Be sure to install spark plug in correct position.

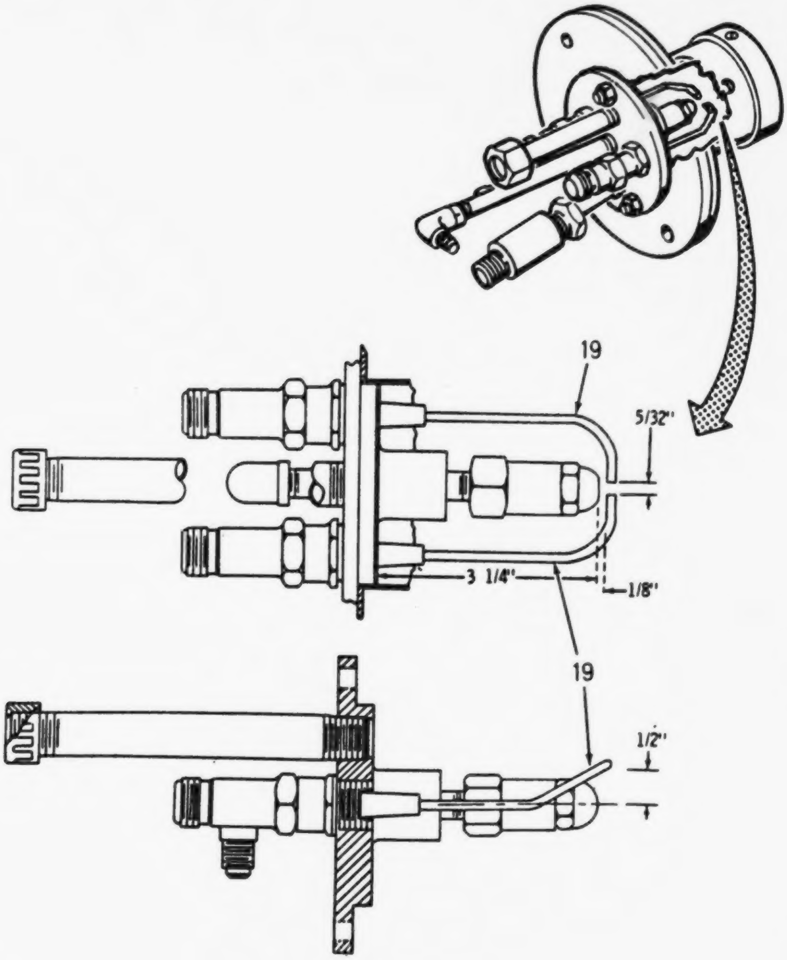
31. Place washer (13) over spark plug electrode and install spark plug (12). Repeat procedure for other spark plug.



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

b. Burner Head Assembly (Cont'd)

32. Bend spark plug electrodes (19) until spark gap is 5/32 inch (4mm) and electrodes are located 1/8 inch (3mm) outward and 1/2 inch (13 mm) upward from hole in burner nozzle.

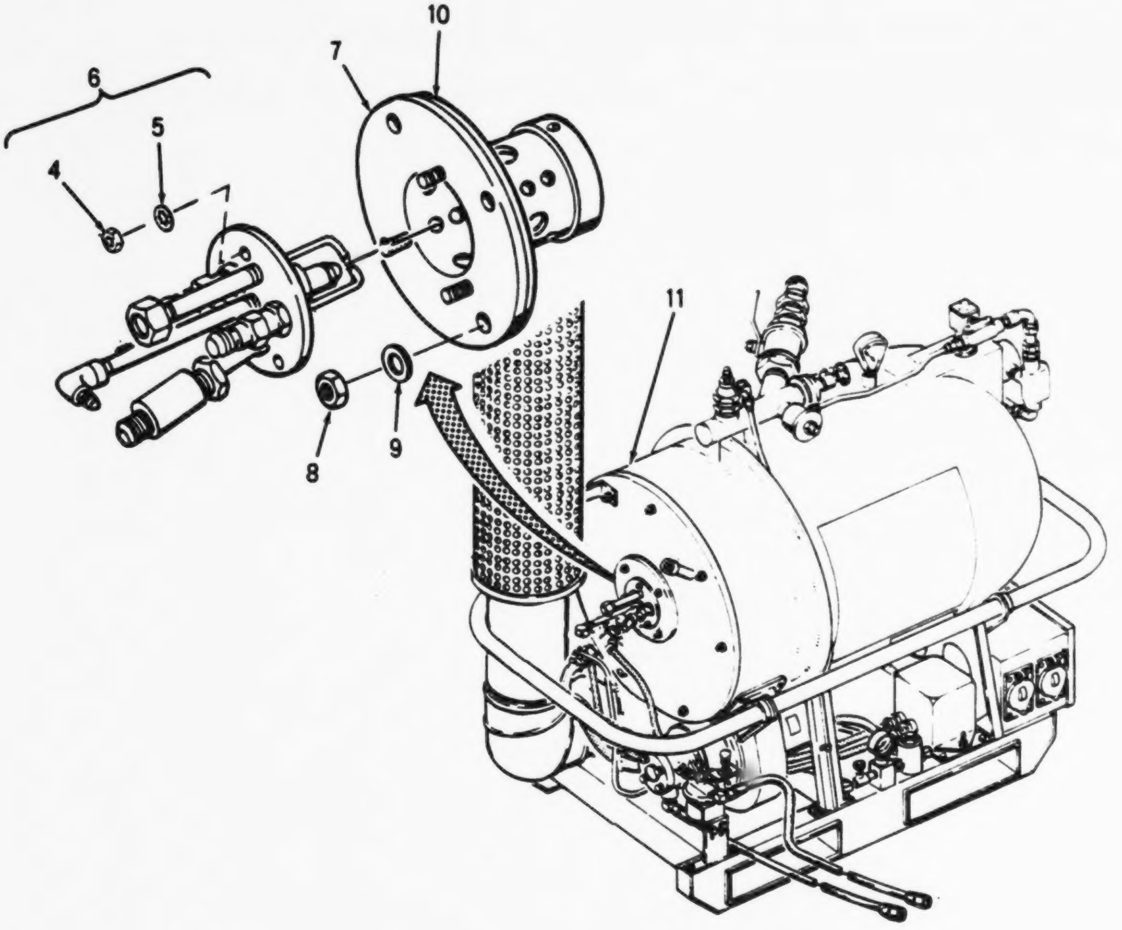


4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

b. Burner Head Assembly (Cont'd)

33. Install burner tube (7) and gasket (10) in water heater (11) using four washers (9) and four nuts (8). Tighten nuts.

34. Install nozzle and electrode assembly (6) in burner tube (7) using three washers (5) and three nuts (4). Tighten nuts.



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

b. Burner Head Assembly (Cont'd)

CAUTION

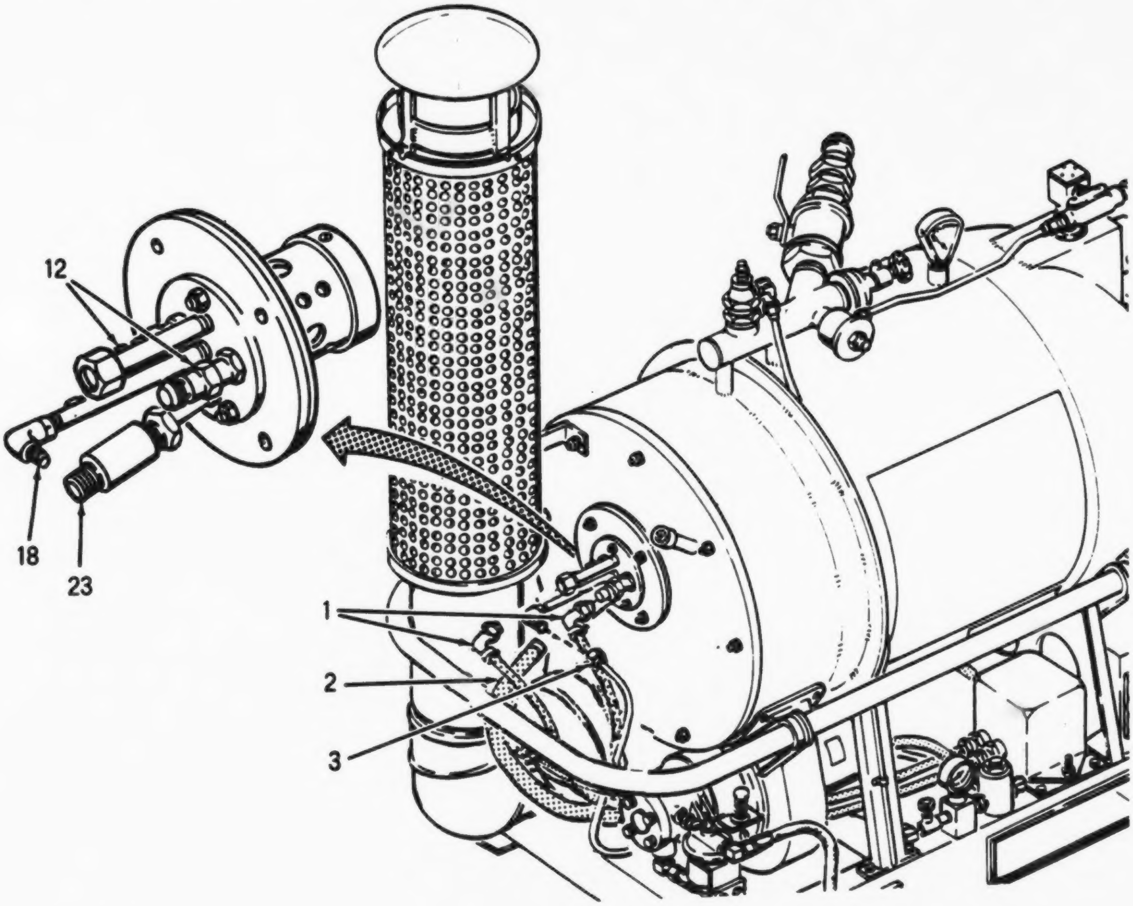
The scanner is a sensitive device. Rough handling can damage the scanner and result in possible failure of flame safeguard control.

35. Inspect scanner (3) for dirt or foreign matter. Clean with a soft cloth if necessary. If scanner is broken or damaged, notify direct support maintenance.

36. Connect scanner (3) to nipple (23) and tighten firmly.

37. Connect two ignition cable assemblies (1) to two spark plugs (12).

38. Connect fuel line coupling (2) to elbow (18).



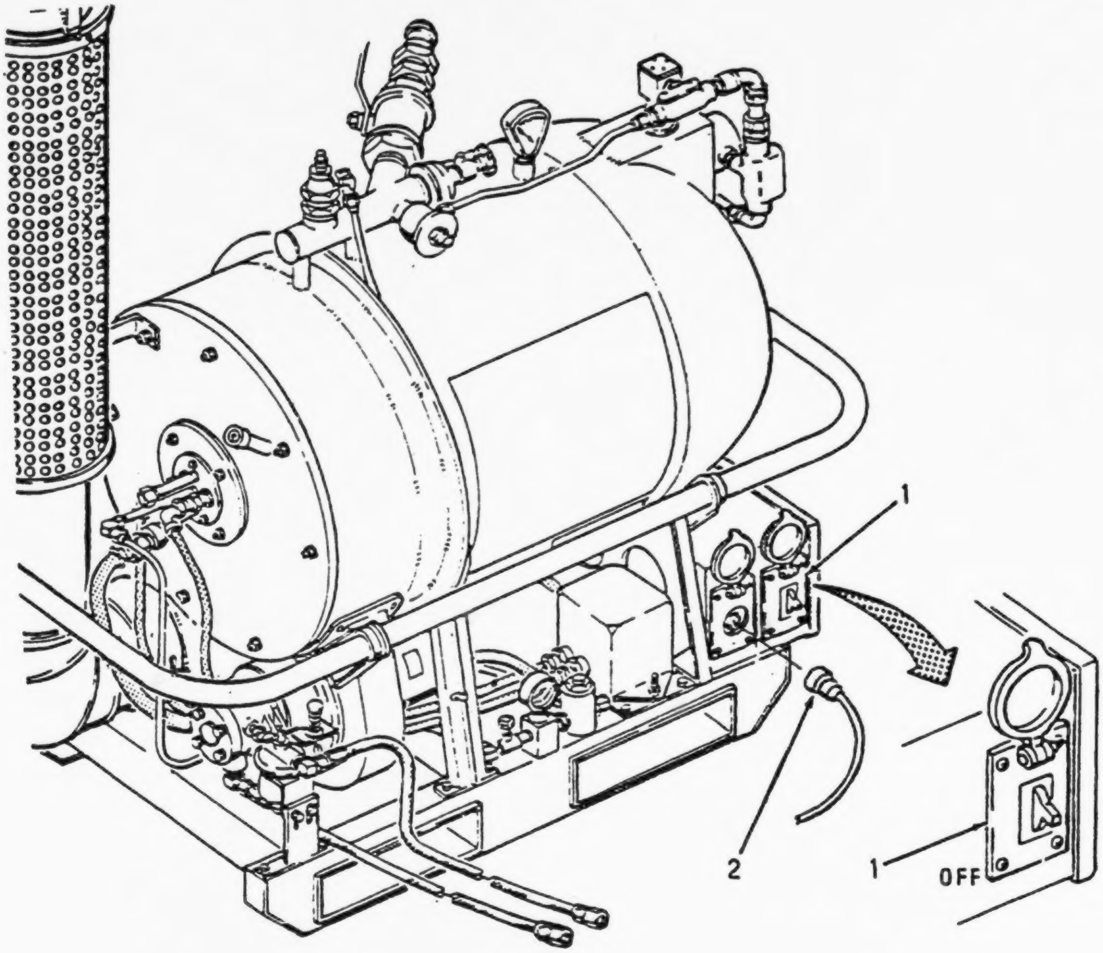
4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

c. Ignition Transformer. Repair the ignition transformer by replacing it as follows:

WARNING

High voltages that are dangerous to human life may be present. Before working on electrical circuits, remove all power from the water heater.

1. Turn off power limit switch (1) and disconnect power cable (2).



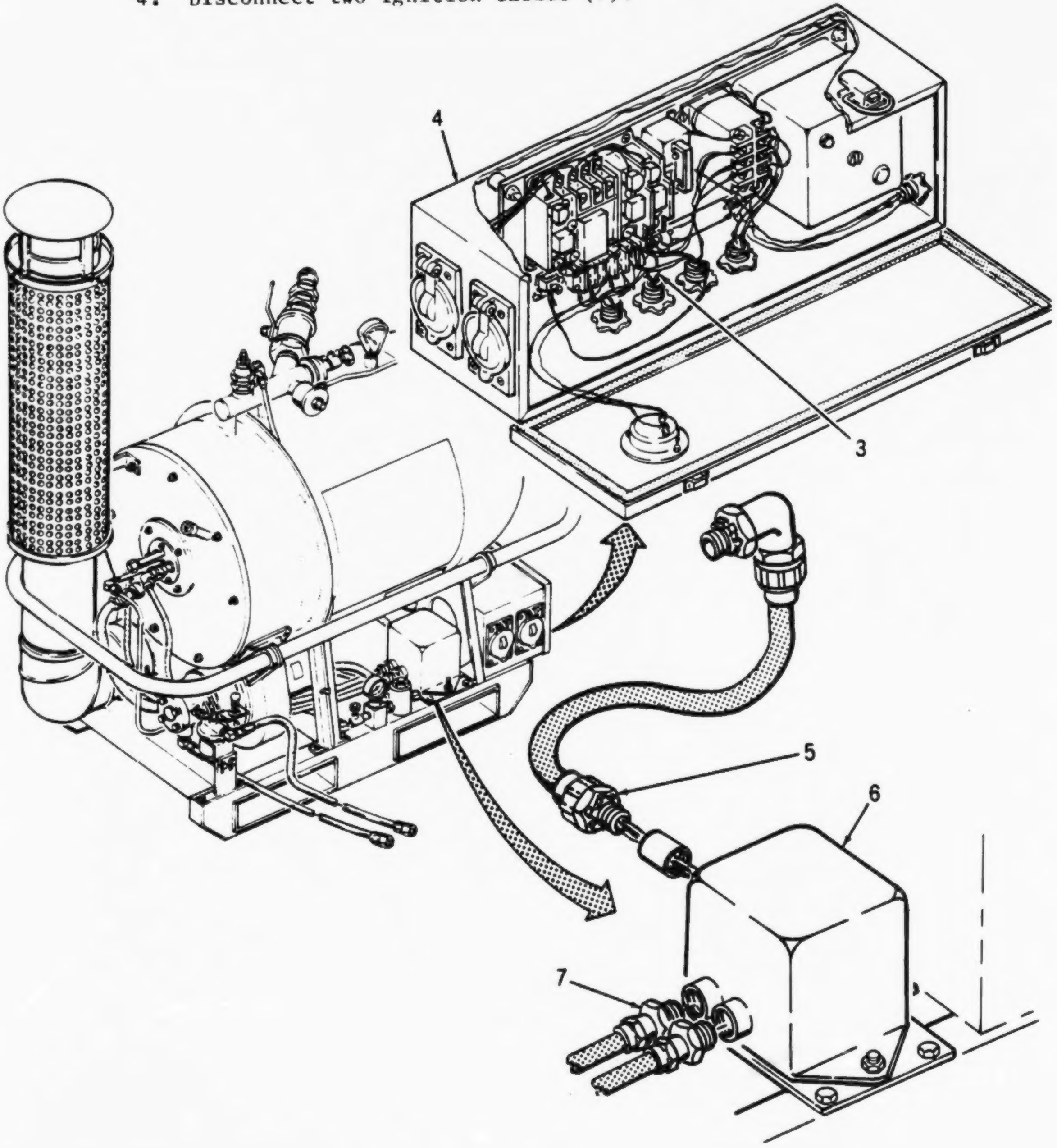
4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

c. Ignition Transformer (Cont'd)

2. Disconnect and tag two wires (3) in control box assembly (4).

3. Disconnect conduit connector (5) at ignition transformer (6).

4. Disconnect two ignition cables (7).



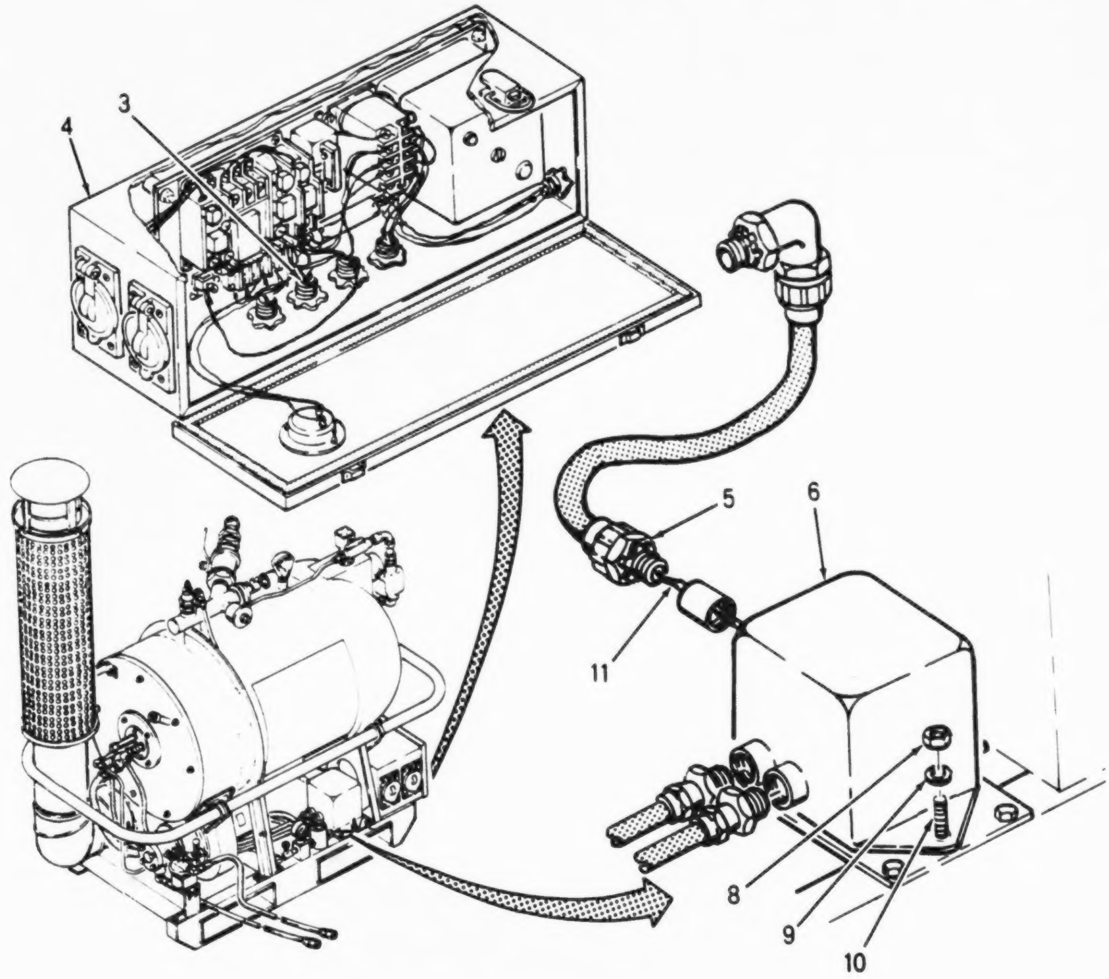
4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

c. Ignition Transformer (Cont'd)

5. Remove two nuts (8) and two washers (9) and lift ignition transformer up to clear studs (10) and pull wires (11) out of conduit.

6. Replace ignition transformer (6) by feeding two wires (3) through conduit (5).

7. Set ignition transformer (6) in place on studs (10) and secure with two washers (9) and two nuts (8).

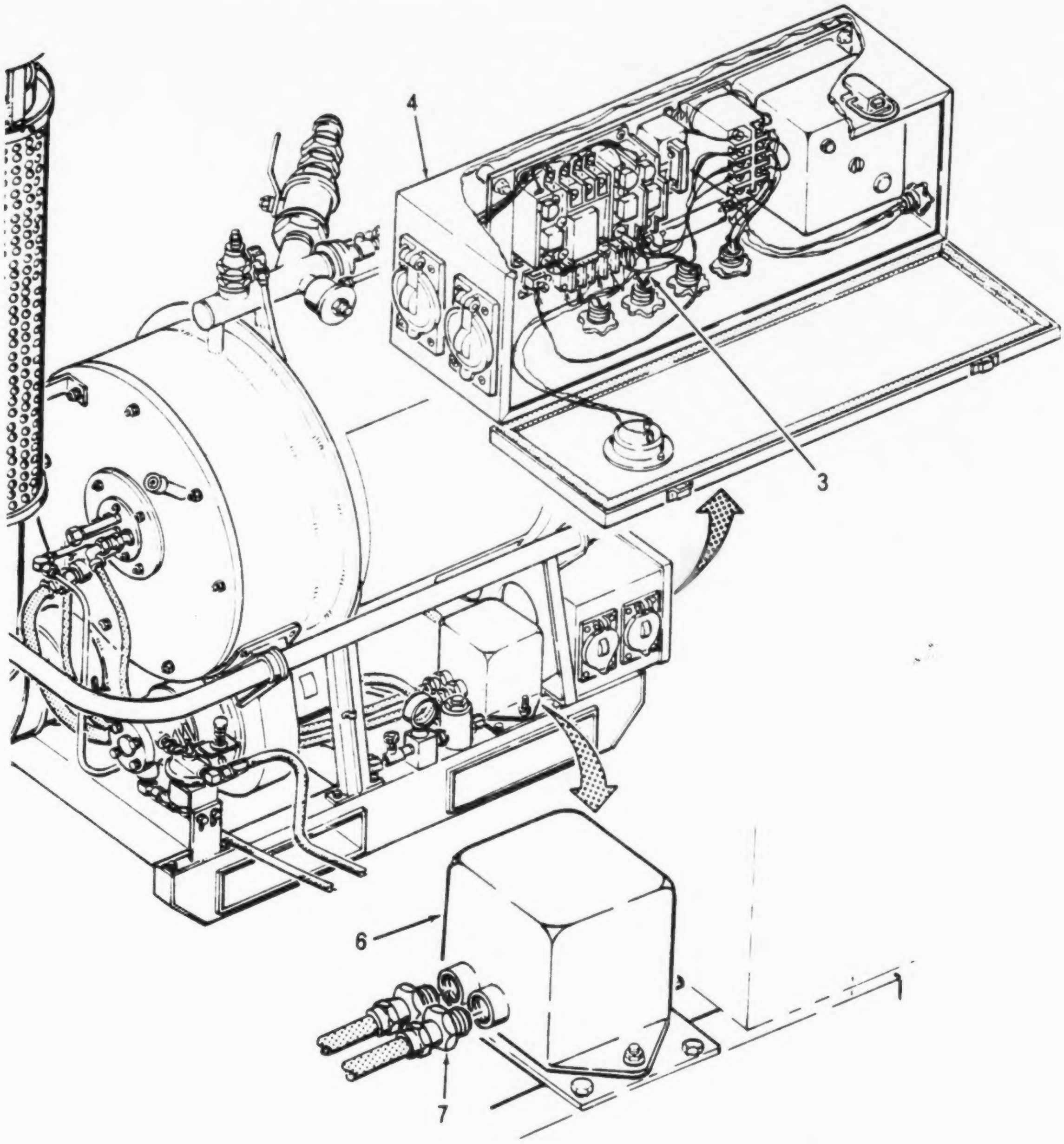


4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

c. Ignition Transformer (Cont'd)

8. Connect ignition cables (7) to ignition transformer (6) by turning connectors clockwise.

9. Connect two wires (3) as tagged in control box (4).



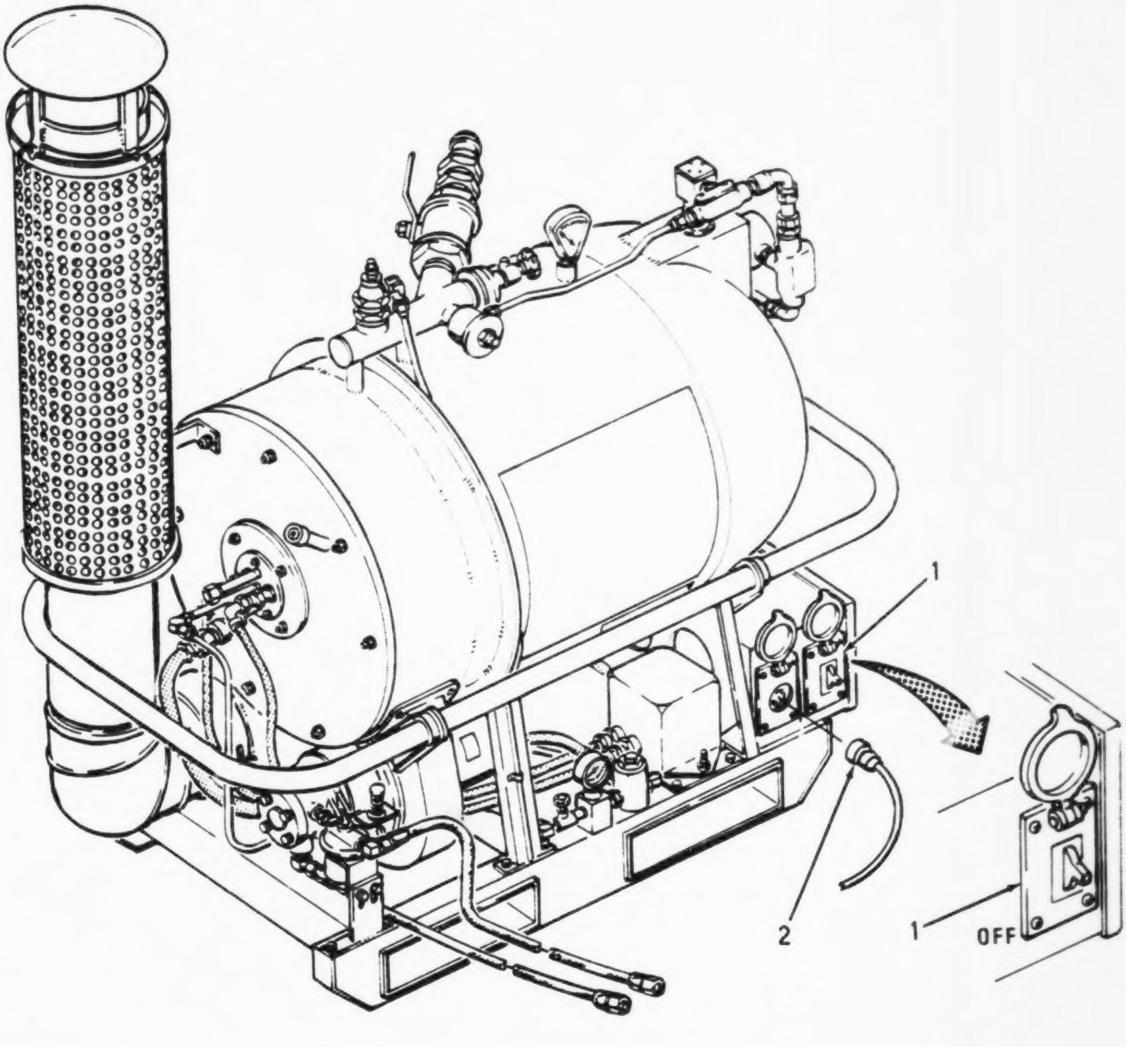
4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

d. Conduit, Electrical Fittings, and Wiring. The water heater has rigid conduit and flexible conduit, each with watertight fittings. Repair defective conduit or wires by replacement.

WARNING

High voltages that are dangerous to human life may be present. Before working on electrical circuits, remove all power from the water heater.

1. Turn off power switch (1) and disconnect power cable (2).



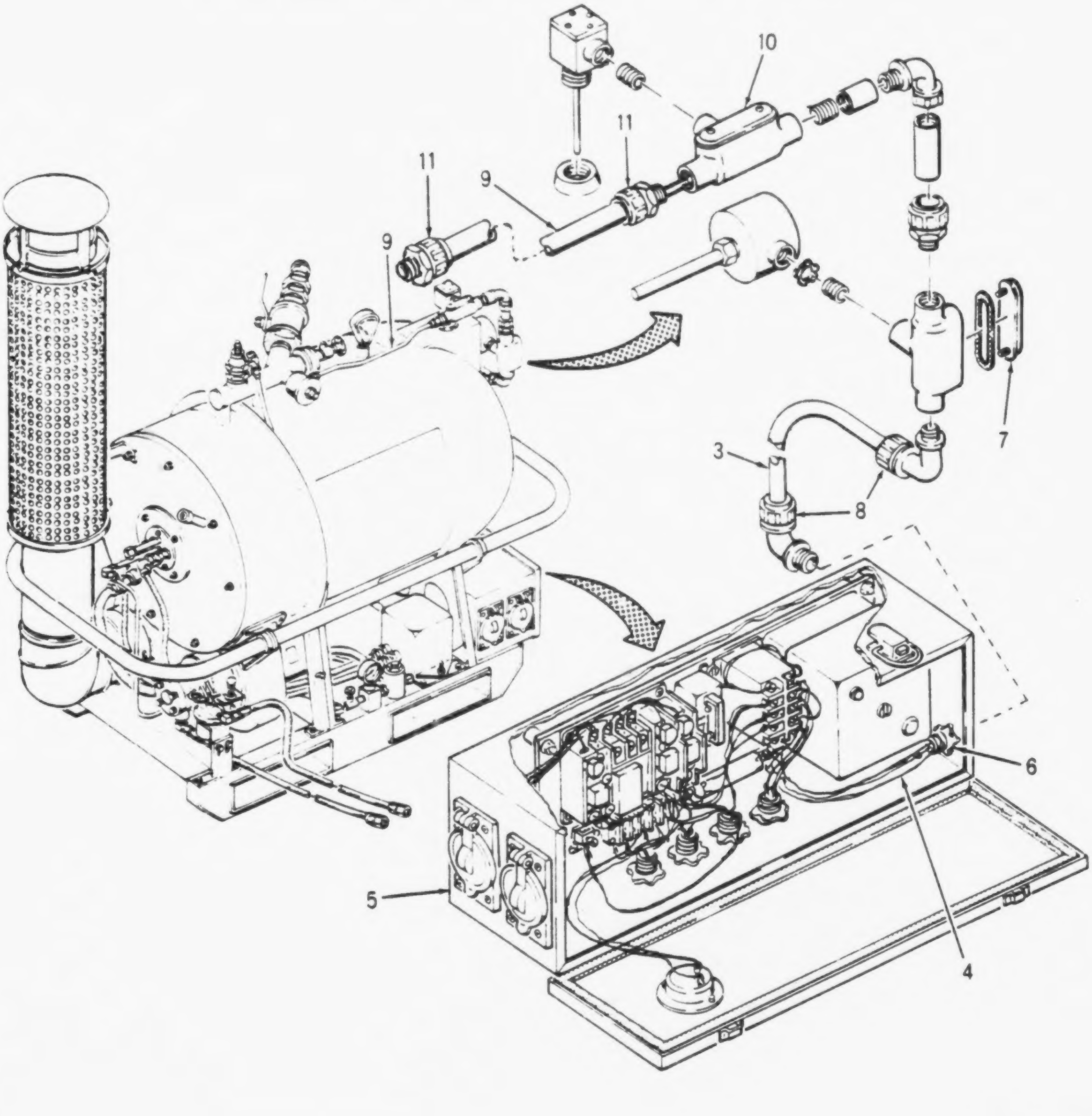
4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

d. Conduit, Electrical Fittings, and Wiring (Cont'd)

2. To remove rigid conduit (3), tag and disconnect wires (4) in control box (5) and remove nut (6).

3. Remove inspection plate (7) and disconnect wires. Loosen nut (8) and slide conduit (3) out, pulling wires through conduit.

4. Remove upper conduit (9) by removing inspection plate (10) and disconnect wires. Loosen nuts (11) on both ends of conduit and slide conduit out, pulling wires through conduit.



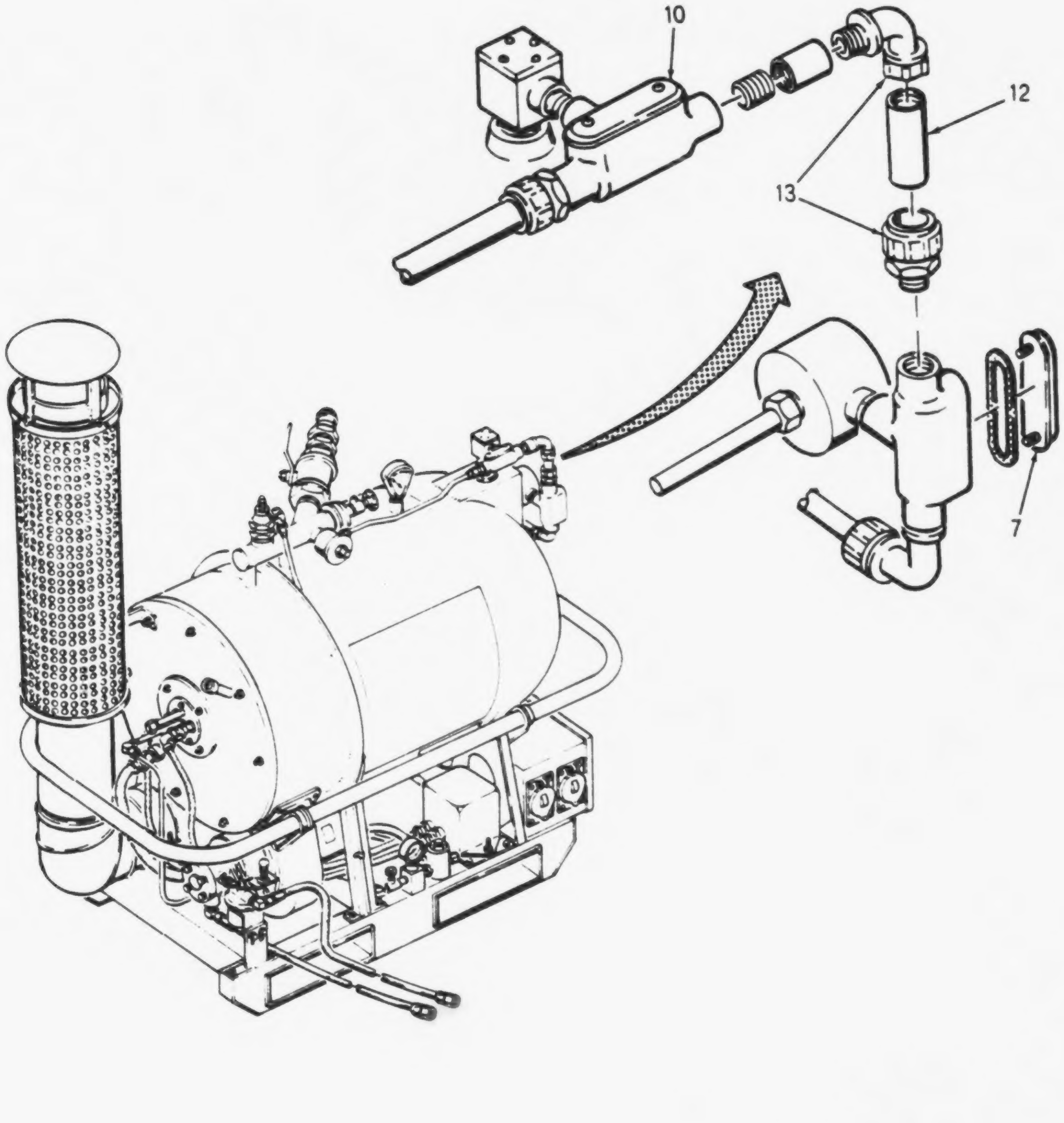
4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

d. Conduit, Electrical Fittings, and Wiring (Cont'd)

5. Remove short conduit (12) by removing inspection plate (7) and disconnect wires.

6. Loosen nuts (13) and slip conduit out, pulling wires through.

7. Replace broken or burned wires by opening inspection plates (7, 10) and pulling damaged wire out.

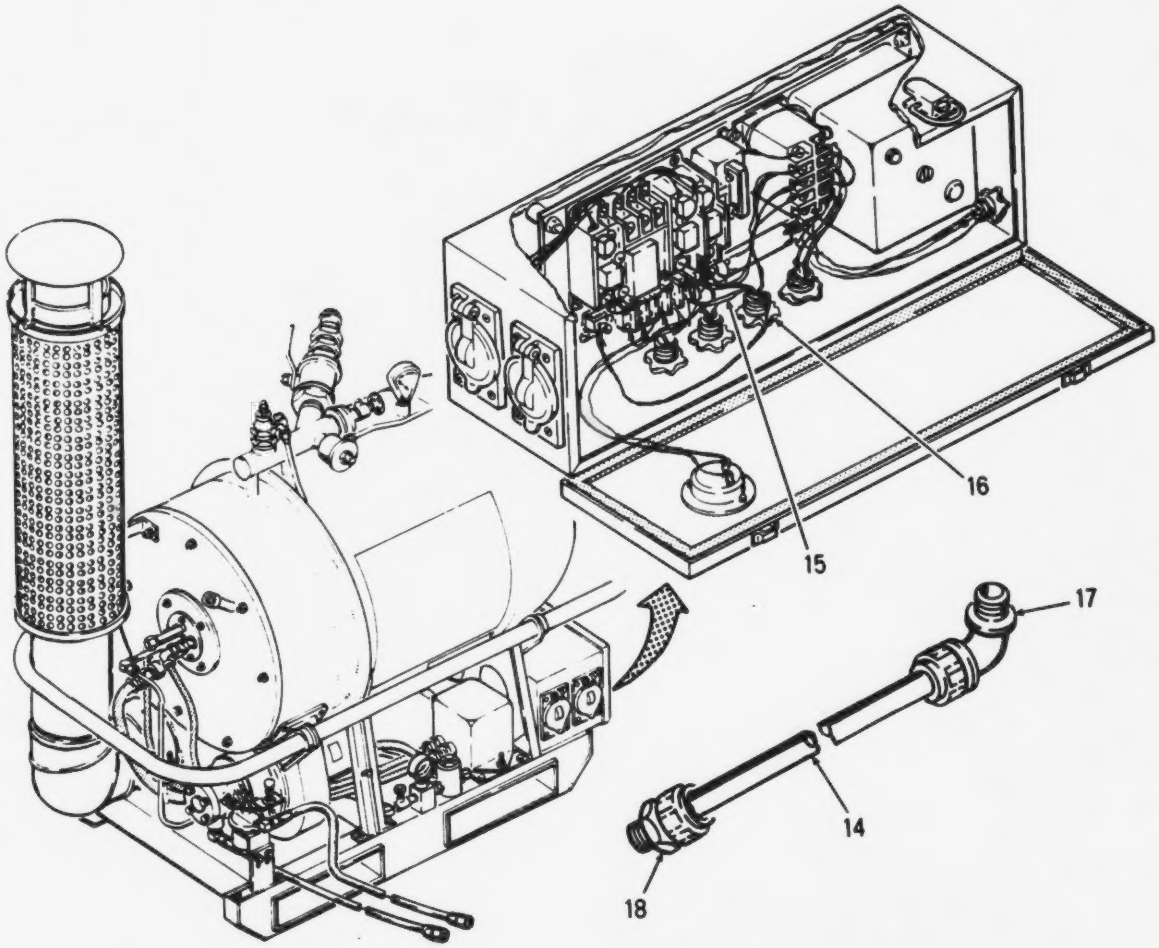


4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

d. Conduit, Electrical Fittings, and Wiring (Cont'd)

8. To remove flexible conduit (14), tag and disconnect associated wires (15), and remove nut (16). Push connector (17) out.

9. Unscrew fitting (18) at other end of conduit and pull wires through.



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

d. Conduit, Electrical Fittings, and Wiring (Cont'd)

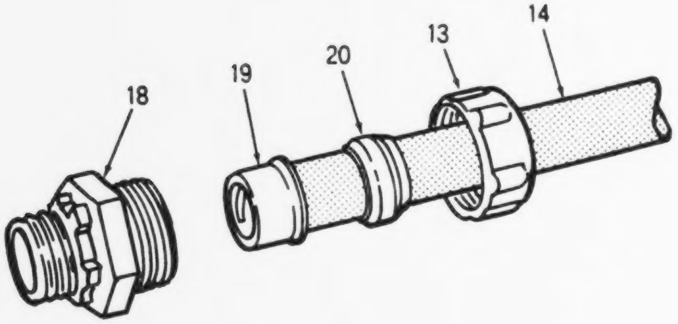
10. To remove fitting from flexible conduit (14), unscrew nut (13) from fitting (18) and disengage conduit.

11. Remove ground cone (19) from conduit (14) by unscrewing. Slip nylon ring (20) and nut (13) from conduit.

12. To assembly fitting and conduit, measure correct length of conduit and cut end square with no jagged edges.

13. Slide nut (13) and nylon ring (20) onto conduit (14) and screw ground cone (19) into conduit.

14. Screw nut (13) to fitting (18).



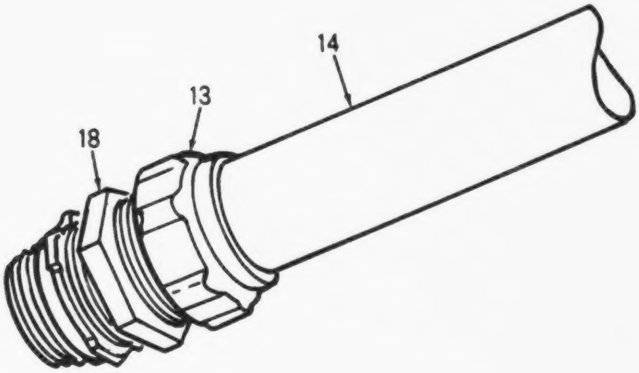
4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

d. Conduit, Electrical Fittings, and Wiring (Cont'd)

15. To remove fitting from rigid conduit (14), use two wrenches to hold nut (13) and fitting (18) and turn nut counterclockwise until loose. Slide fitting and nut off conduit.

16. To assemble fitting and conduit, measure correct length of conduit and cut end square with no jagged edge. Bend conduit if necessary to correct shape.

17. Slide nut (13) and fitting (18) onto end of conduit (14) and tighten nut (13) against fitting (18).



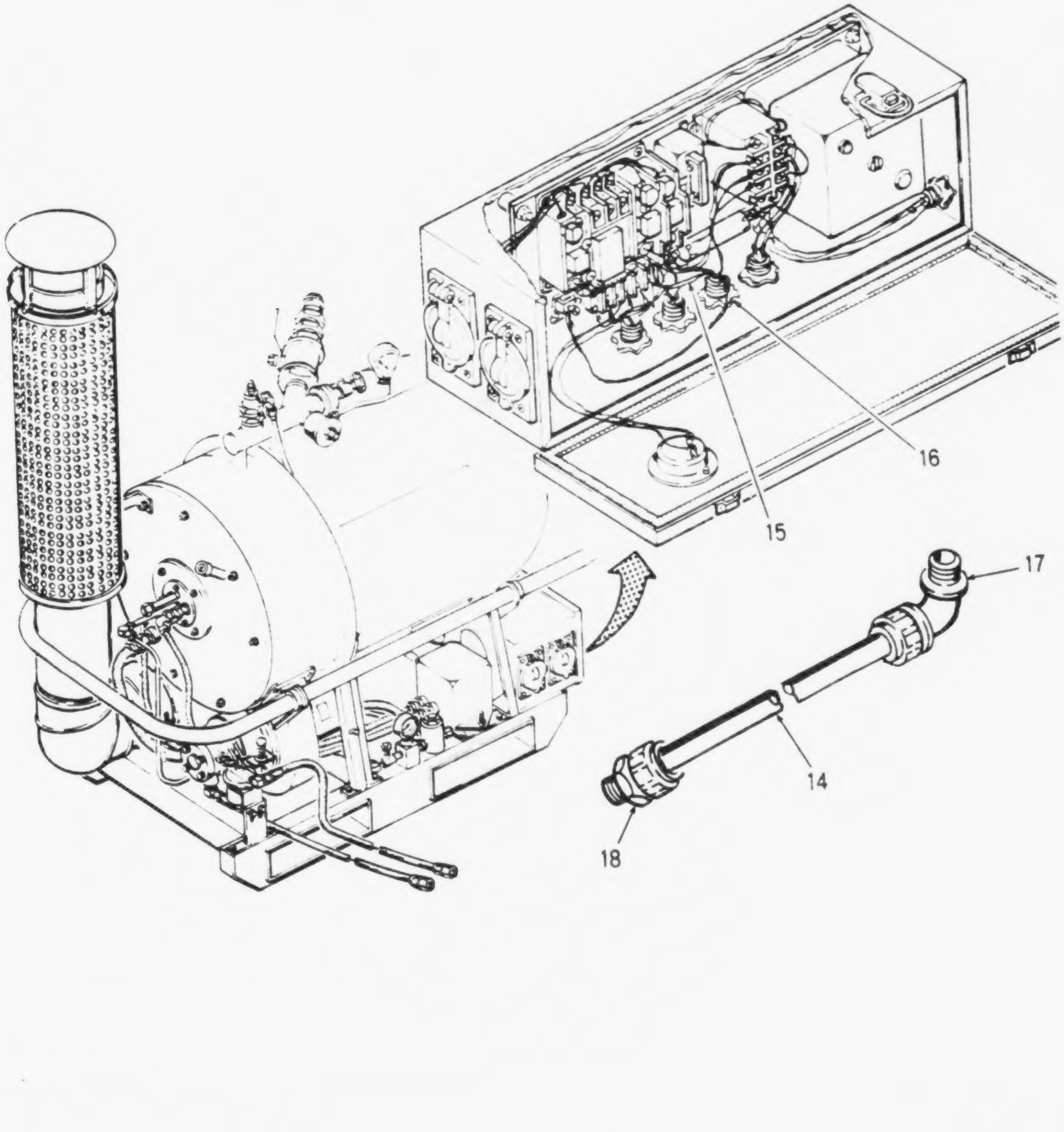
4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

d. Conduit, Electrical Fittings, and Wiring (Cont'd)

18. To install flexible conduit, thread wires through conduit at fitting (18).

19. Screw fitting (18) into mating fitting, ensuring that wires do not become twisted inside conduit.

20. Push connector (17) through hole in control box (5) and secure with nut (16). Connect tagged wires (15) inside control box.



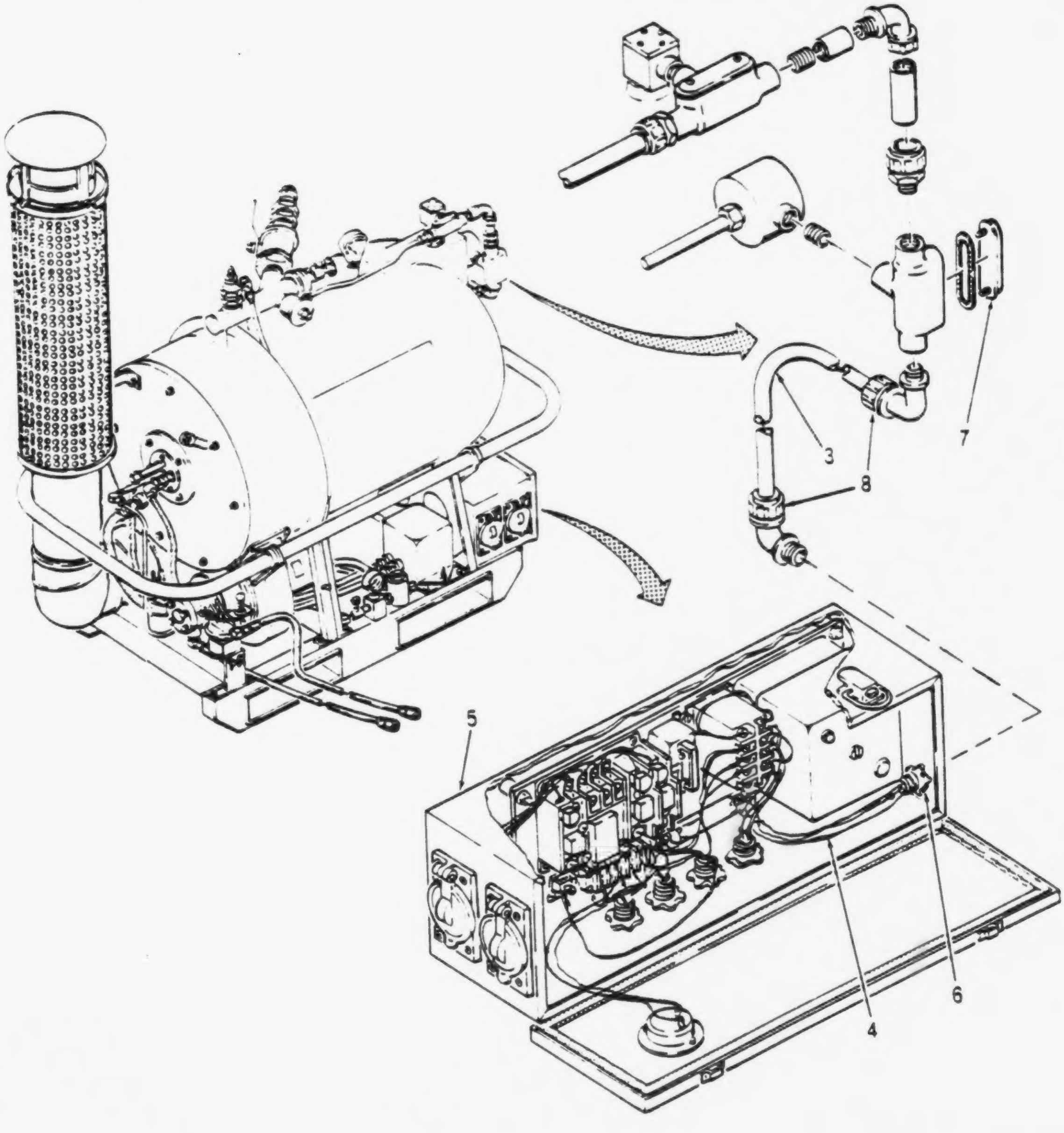
4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

d. Conduit, Electrical Fittings, and Wiring (Cont'd)

21. To install rigid conduit, thread wires through conduit and through fitting. Insert conduit (3) into fitting and tighten nut (8).

22. Push fitting through hole in control box (5) and secure with nut (6). Connect tagged wires (4) inside control box.

23. If necessary, connect wires on other end and secure plate (7).

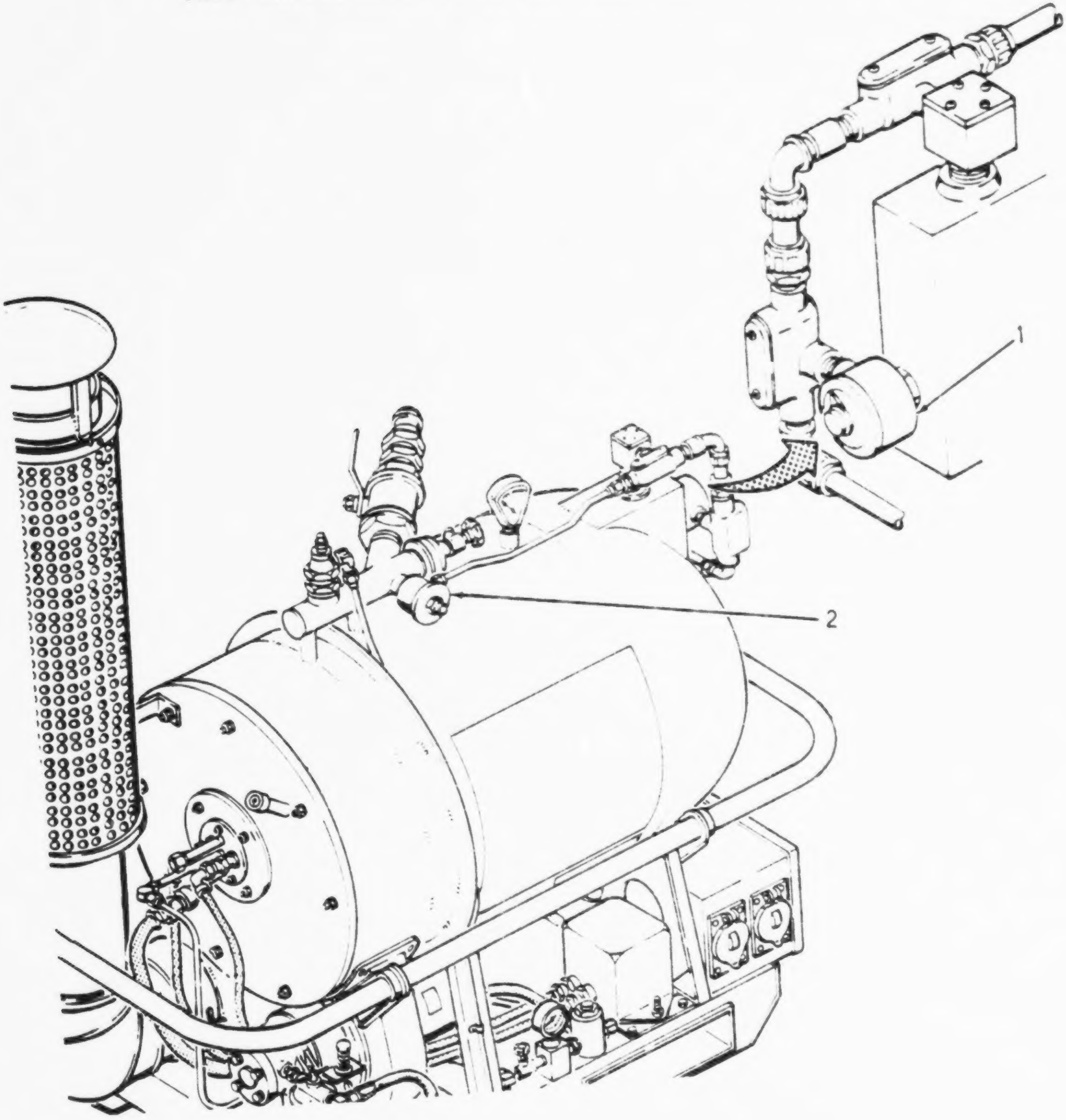


4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

e. Temperature Limit Controls Adjustment. It is safe to adjust the operating control (1) to the limits of its dial. If normal operation does not correct temperature, notify direct support maintenance.

WARNING

Do not adjust high limit control (2) while the control is installed on the water heater. Improper operation of this control could cause the water heater to blow up.



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

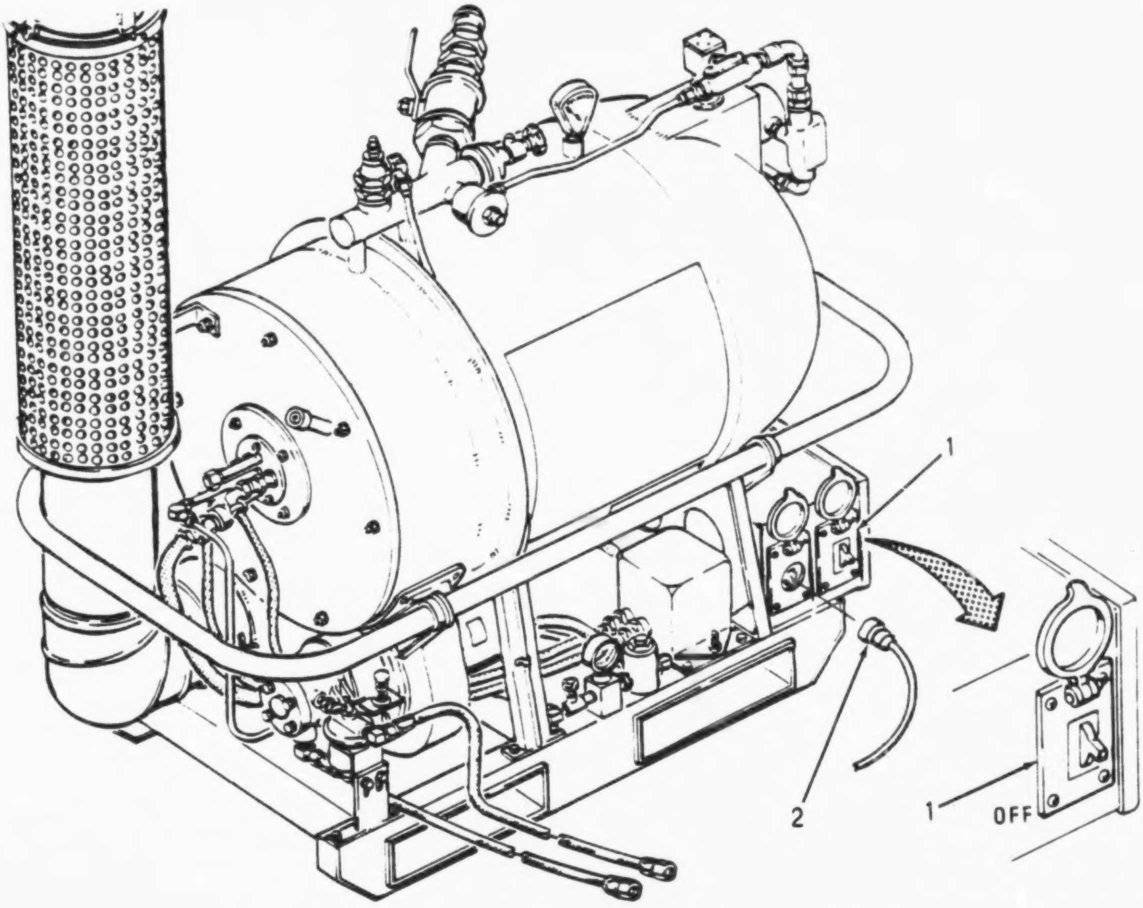
f. Manifold Connections and Fittings. Repair the manifold fittings by replacing them if they are broken or otherwise become unfit for use.

1. Turn off power limit switch (1) and disconnect power cable (2).

WARNING

Hot water under pressure is present in the water heater. Do not attempt to work on plumbing until the water heater cools down.

2. Allow hot water temperature to cool before proceeding.



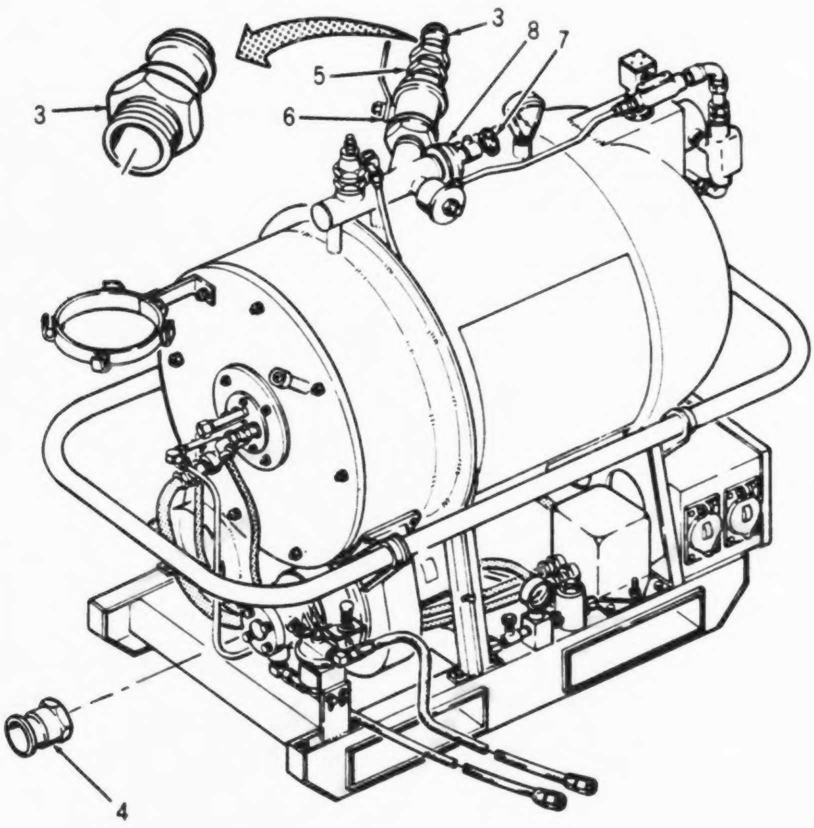
4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

f. Manifold Connections and Fittings (Cont'd)

3. Unscrew coupling (3) and coupling (4) and remove.

4. Unscrew bushing (5) and valve (6) and remove.

5. Unscrew boiler drain cock (7) and coupling (8) and remove.



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

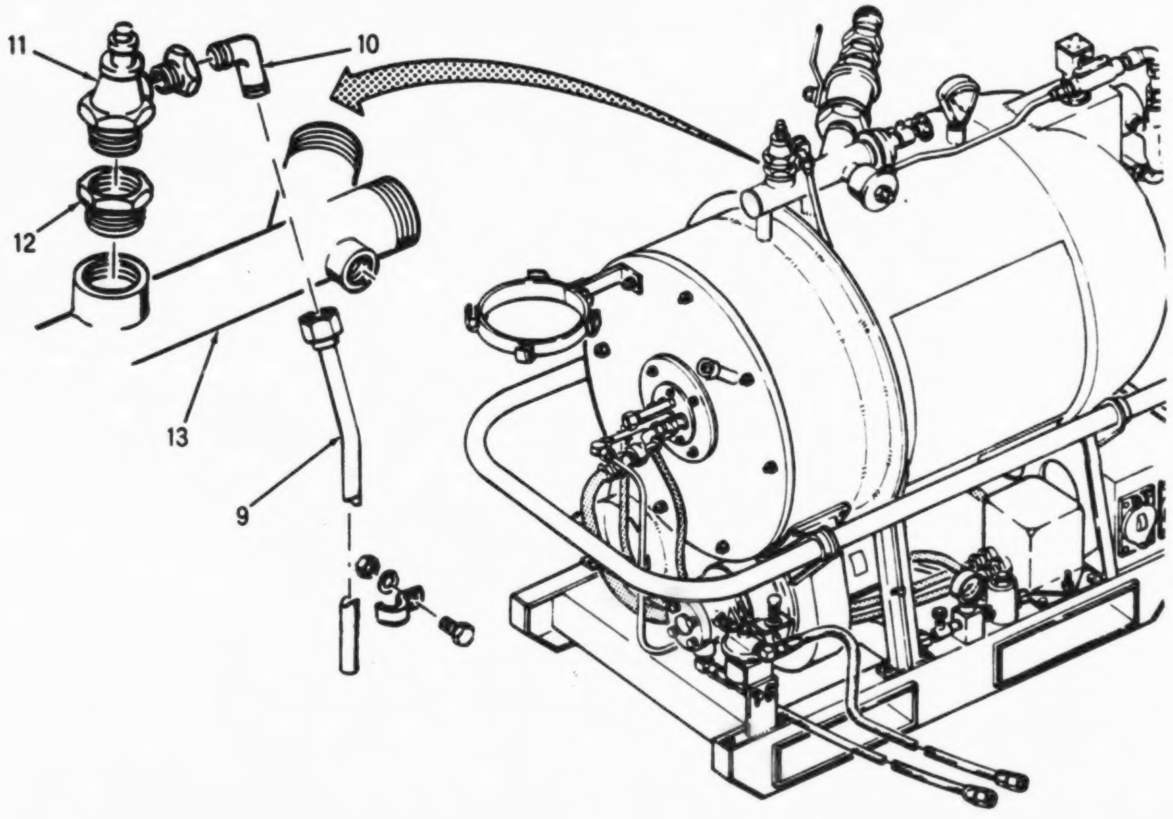
f. Manifold Connections and Fittings (Cont'd)

6. Unscrew overflow tube fitting (9) and elbow (10) and remove.

7. Unscrew relief valve (11) and bushing (12) and remove.

NOTE

Before installing fittings, coat threads with pipe joint compound (14, Appendix E).



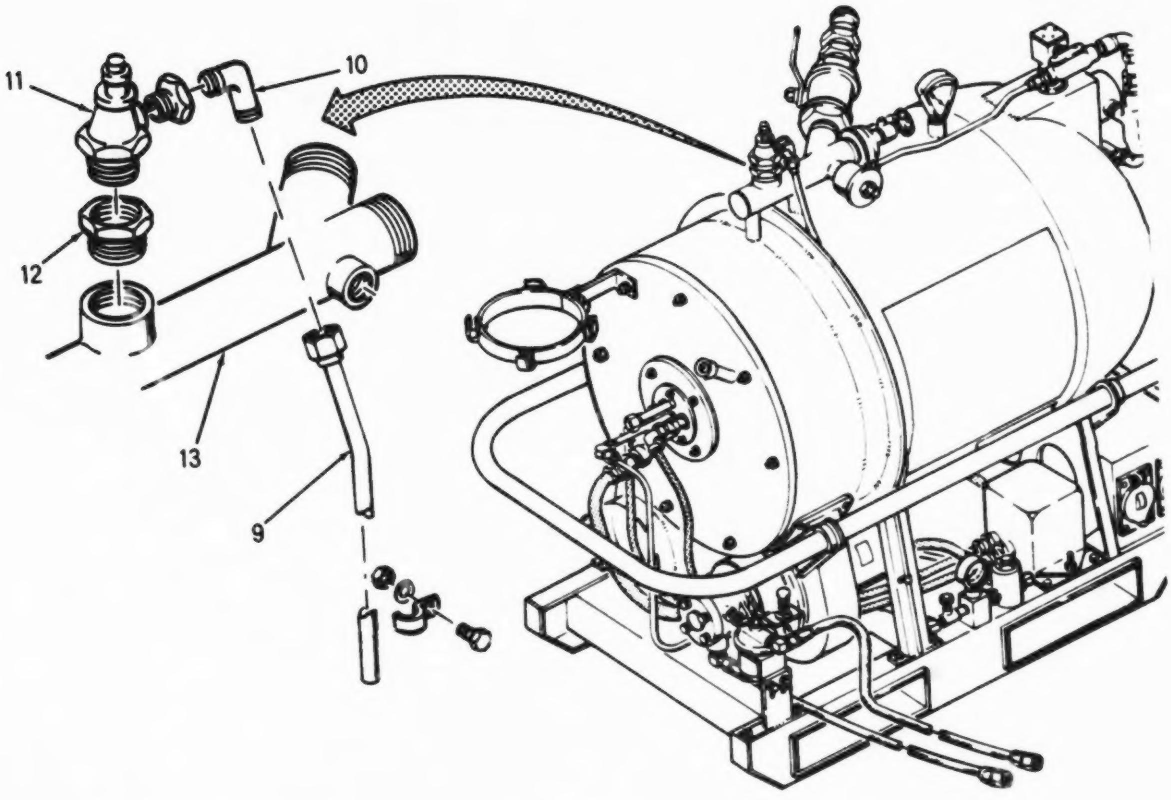
4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

f. Manifold Connections and Fittings (Cont'd)

8. Install bushing (12) in manifold (13) and relief valve (11) into bushing by turning clockwise.

9. Install elbow (10) into relief valve (11) by turning clockwise.

10. Install overflow tube by attaching coupler (9) to elbow (10) and turning clockwise.



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

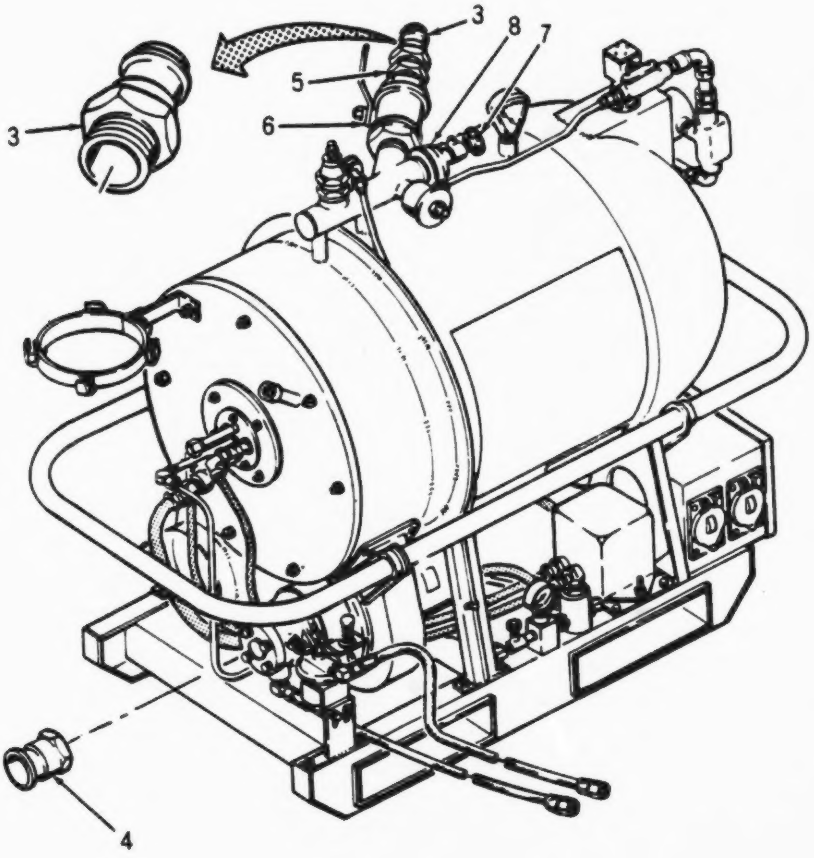
f. Manifold Connections and Fittings (Cont'd)

11. Install coupling (8) on manifold and boiler drain cock (7) in coupling by turning clockwise.

12. Install valve (6) in manifold by turning clockwise.

13. Install bushing (5) in valve (6) and coupling (3) by turning clockwise.

14. Install coupling (4) in lower manifold by turning clockwise.



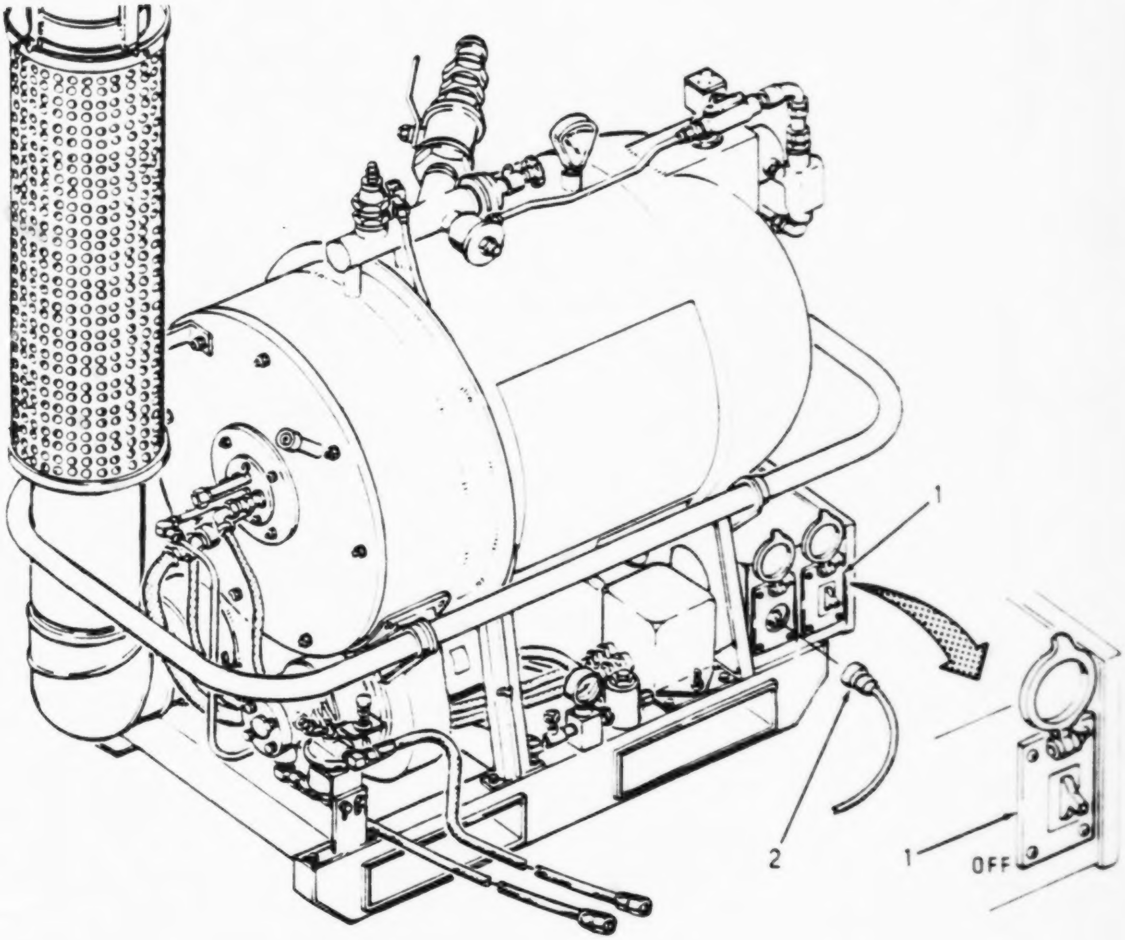
4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

g. Ignition Cable. Repair the ignition cable by replacing it as follows:

WARNING

High voltages that are dangerous to human life may be present. Before working on electrical circuits, remove all power from the water heater.

1. Turn off power switch (1) and disconnect power cable (2).



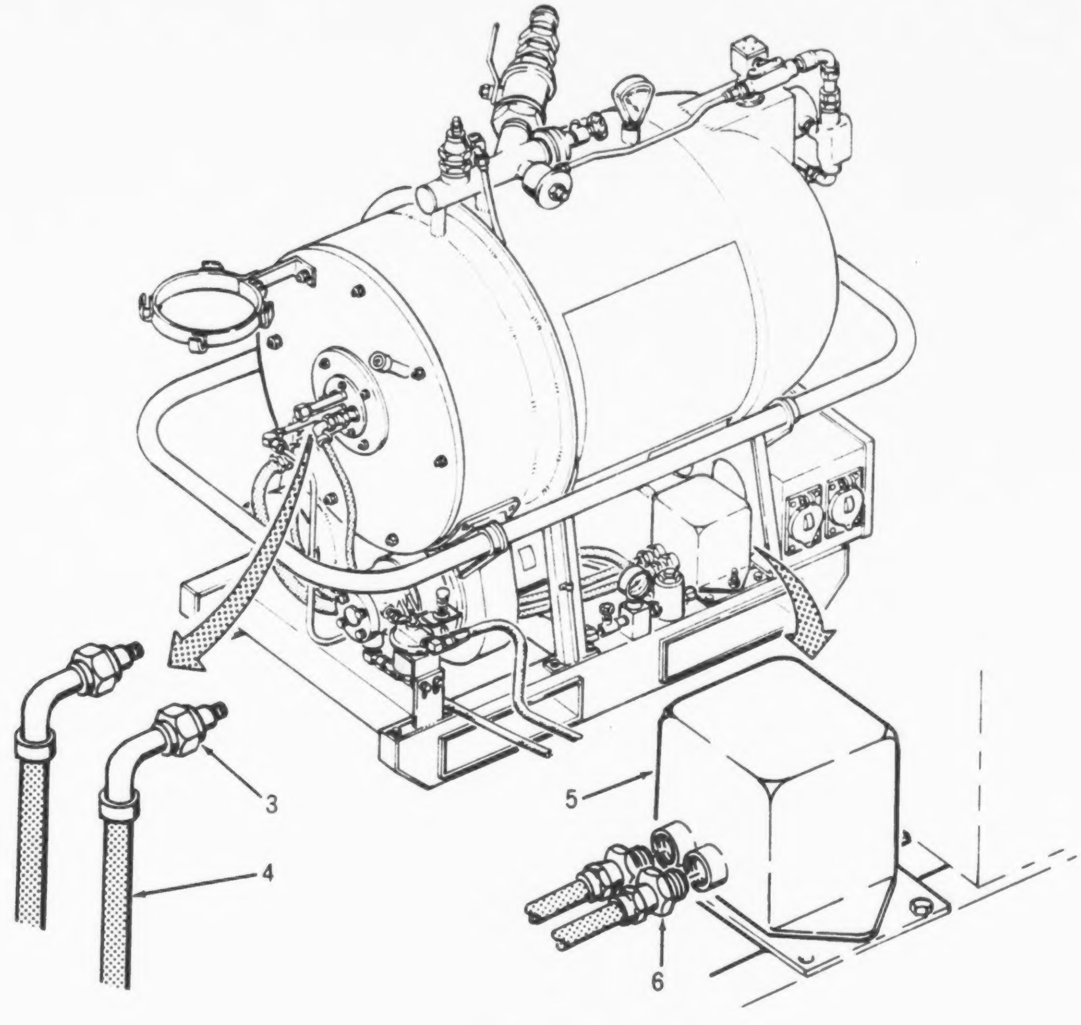
4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

g. Ignition Cable (Cont'd)

2. Loosen nut (3) on ignition cable (4) and disengage cable.

3. At ignition transformer (5), loosen adapter (6), letting cable turn to prevent twisting and disengage cable.

4. Replace cable if contactors on either end appear damaged.

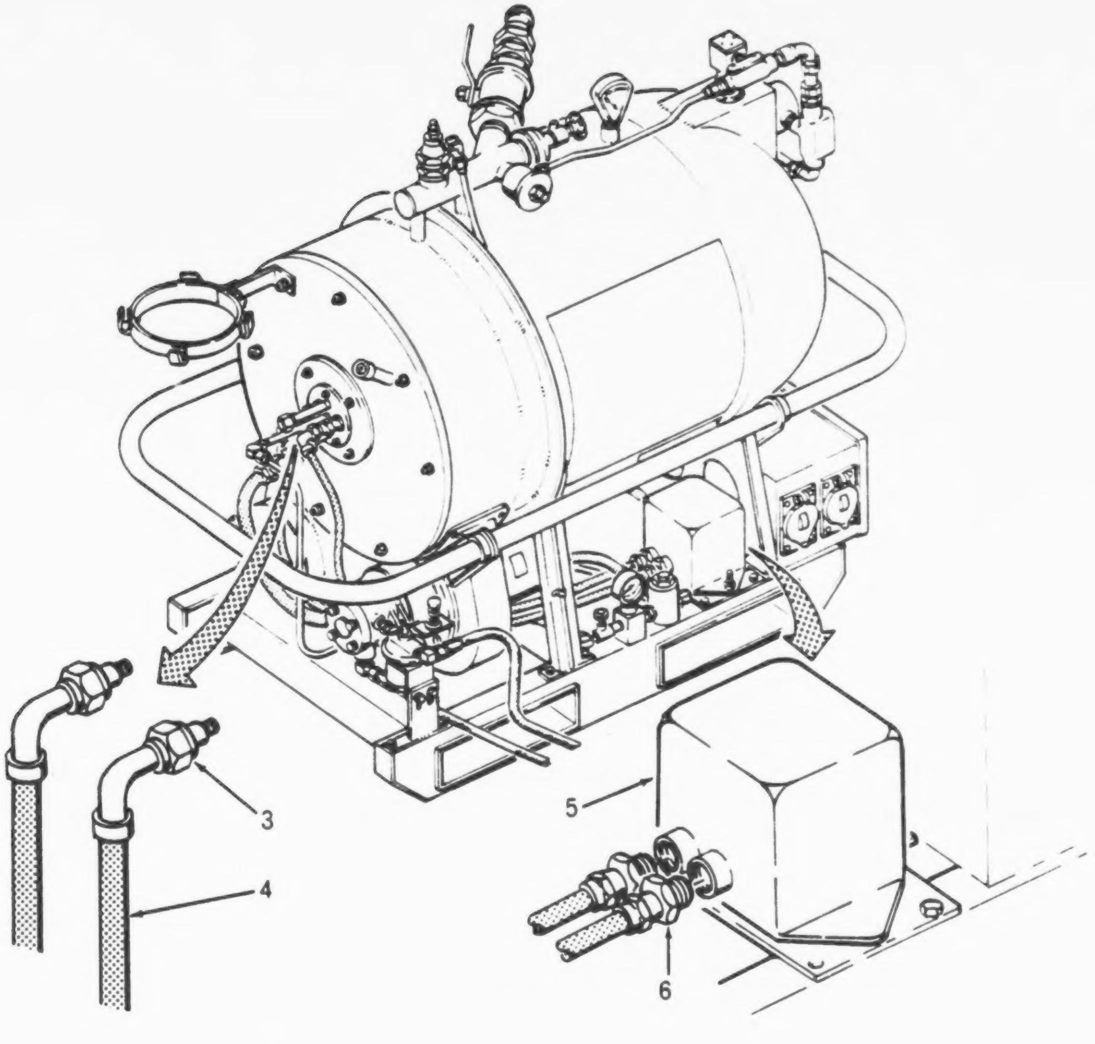


4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

g. Ignition Cable (Cont'd)

5. To replace the ignition cable, connect adapter (6) to ignition transformer (5) first, letting the cable turn with the adapter.

6. Feed cable (4) under water heater and connect nut (3) to spark plug. Tighten nut.



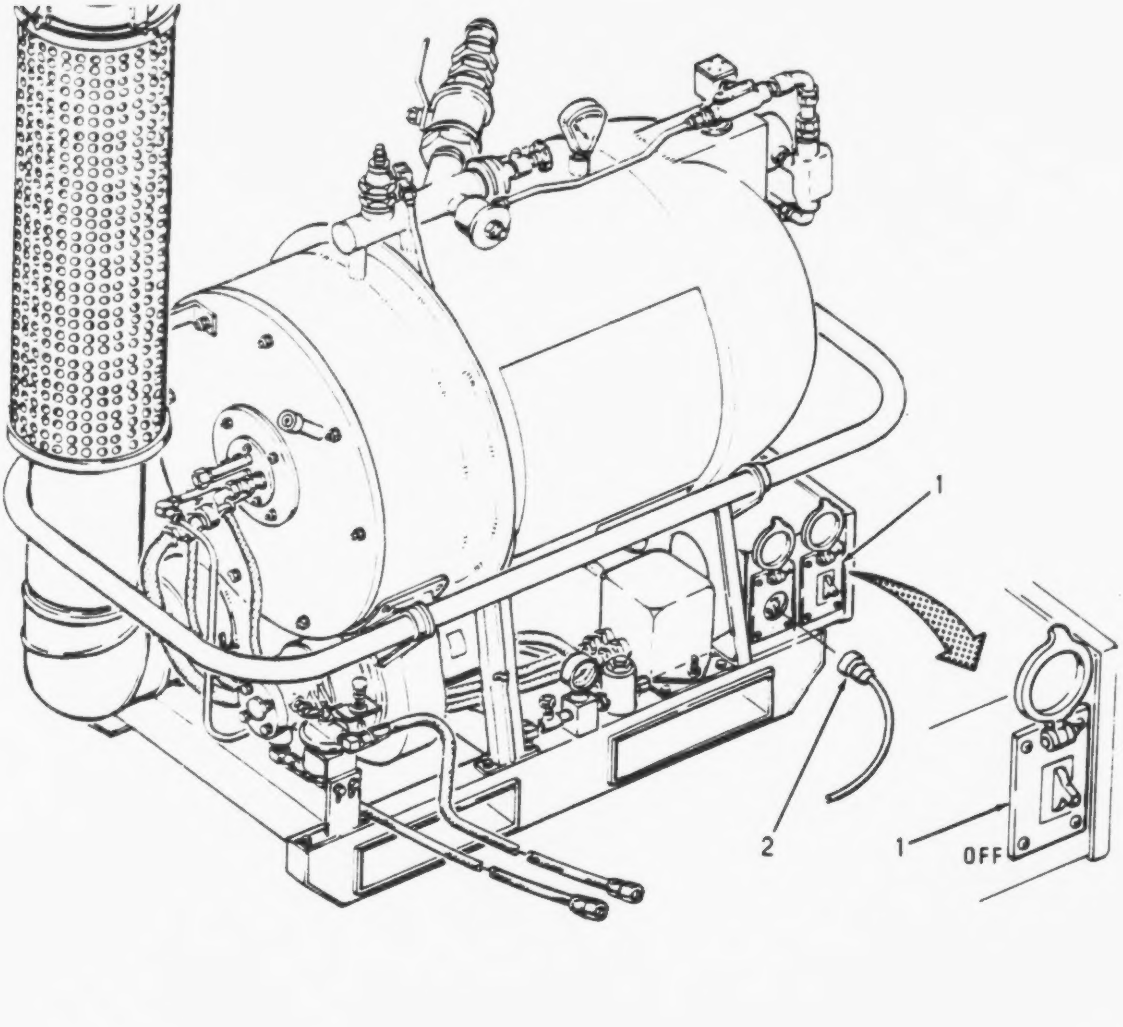
4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

h. Blower Assembly. Use these procedures to remove and replace blower assembly when replacing the blower or blower motor.

WARNING

High voltages that are dangerous to human life may be present. Before working on electrical circuits, remove all power from the water heater.

1. Turn off power switch (1) and disconnect power cable (2).



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

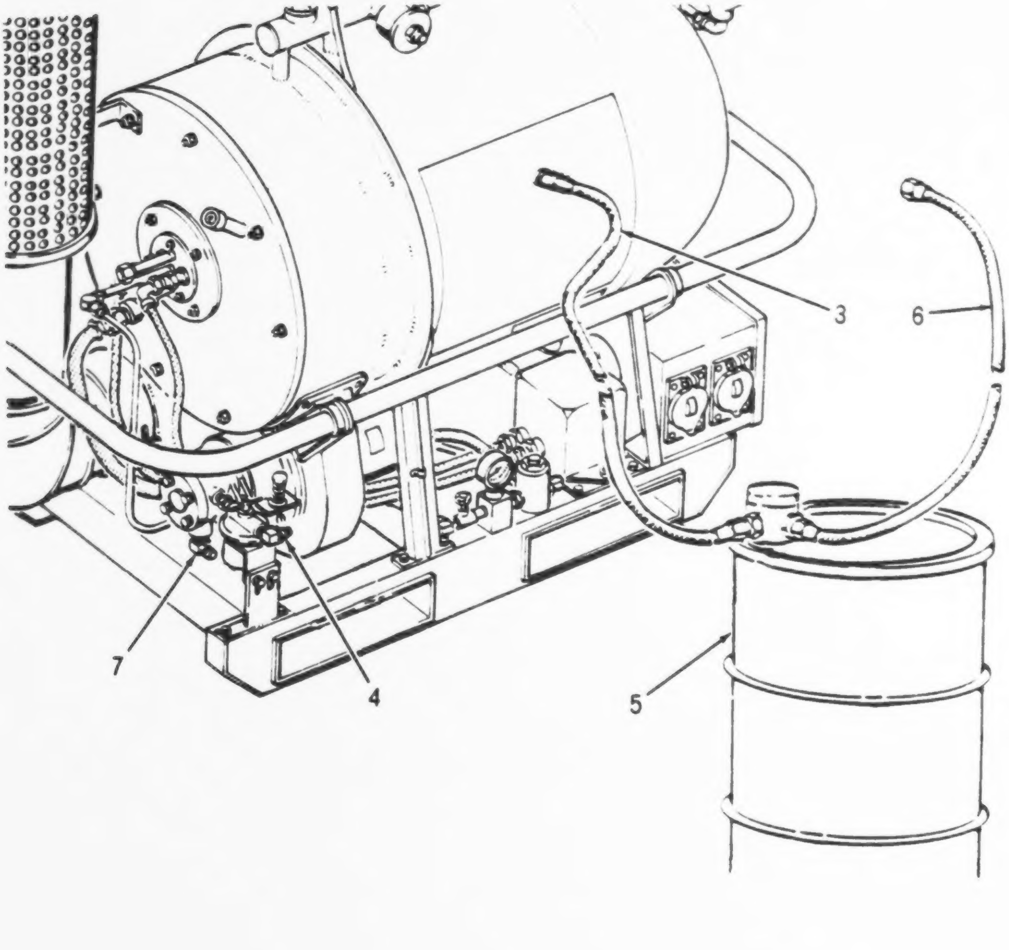
h. Blower Assembly (Cont'd)

WARNING

Exposed fuel and fuel vapor can ignite or explode resulting in possible serious injury and even death. Observe proper safety precautions when servicing fuel system. Ensure water heater is cold before servicing fuel system.

2. Disconnect fuel supply hose (3) from elbow (4), elevate hose to allow fuel to drain back into container (5) and then rest hose on container.

3. Disconnect fuel return hose (6) from elbow (7), elevate hose to allow fuel to drain back into container (5) and then rest hose on container.



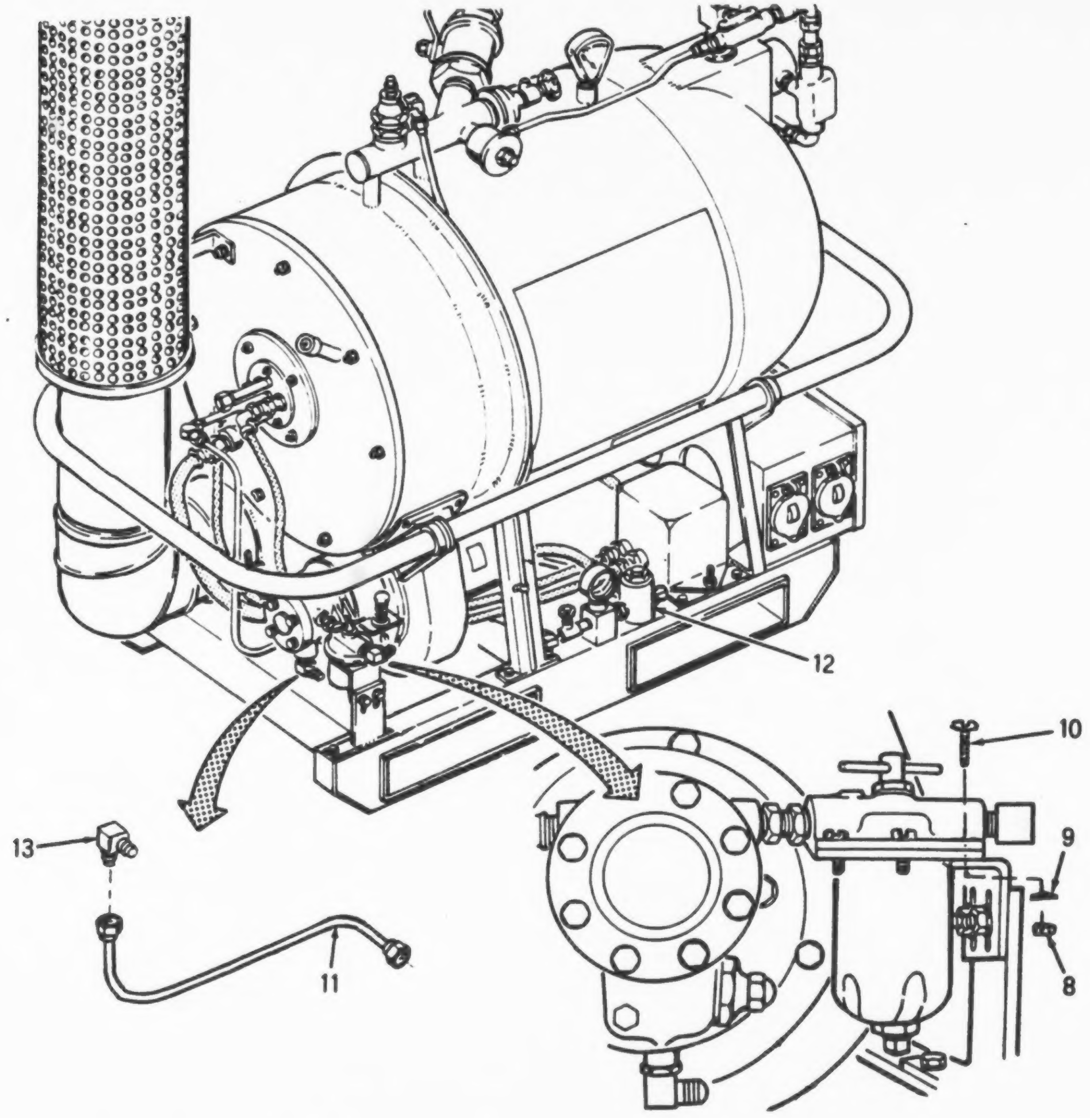
4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

h. Blower Assembly (Cont'd)

4. Remove two nuts (8), two washers (9) and two screws (10).

5. Disconnect fuel line (11) from fuel pump to solenoid valve (12).

6. Disconnect elbow (13) from fuel pump.

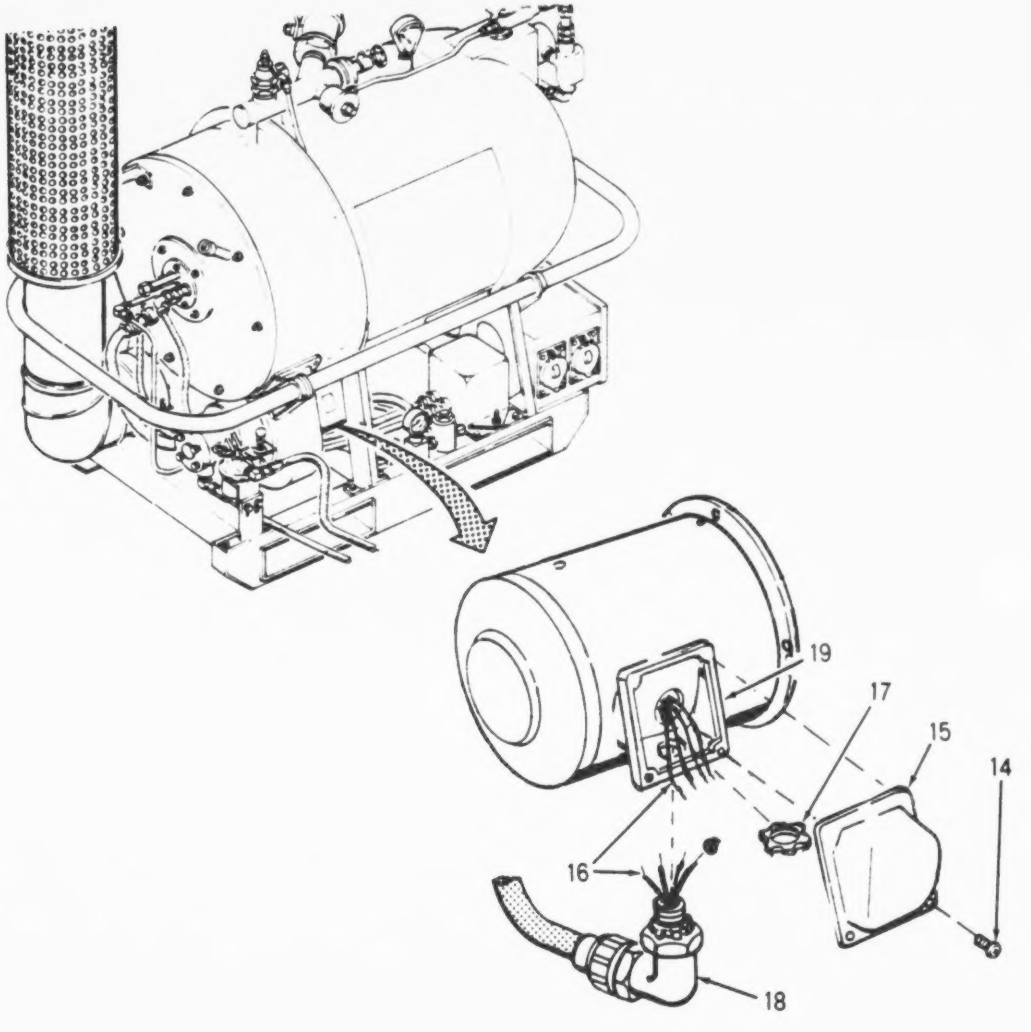


4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

i. Blower Assembly (Cont'd)

7. On back side of blower assembly, unscrew two screws (14) and remove cover plate (15).

8. Tag and disconnect wires (16) and remove nut (17). Push connector (18) down, disconnecting it from junction box (19).



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

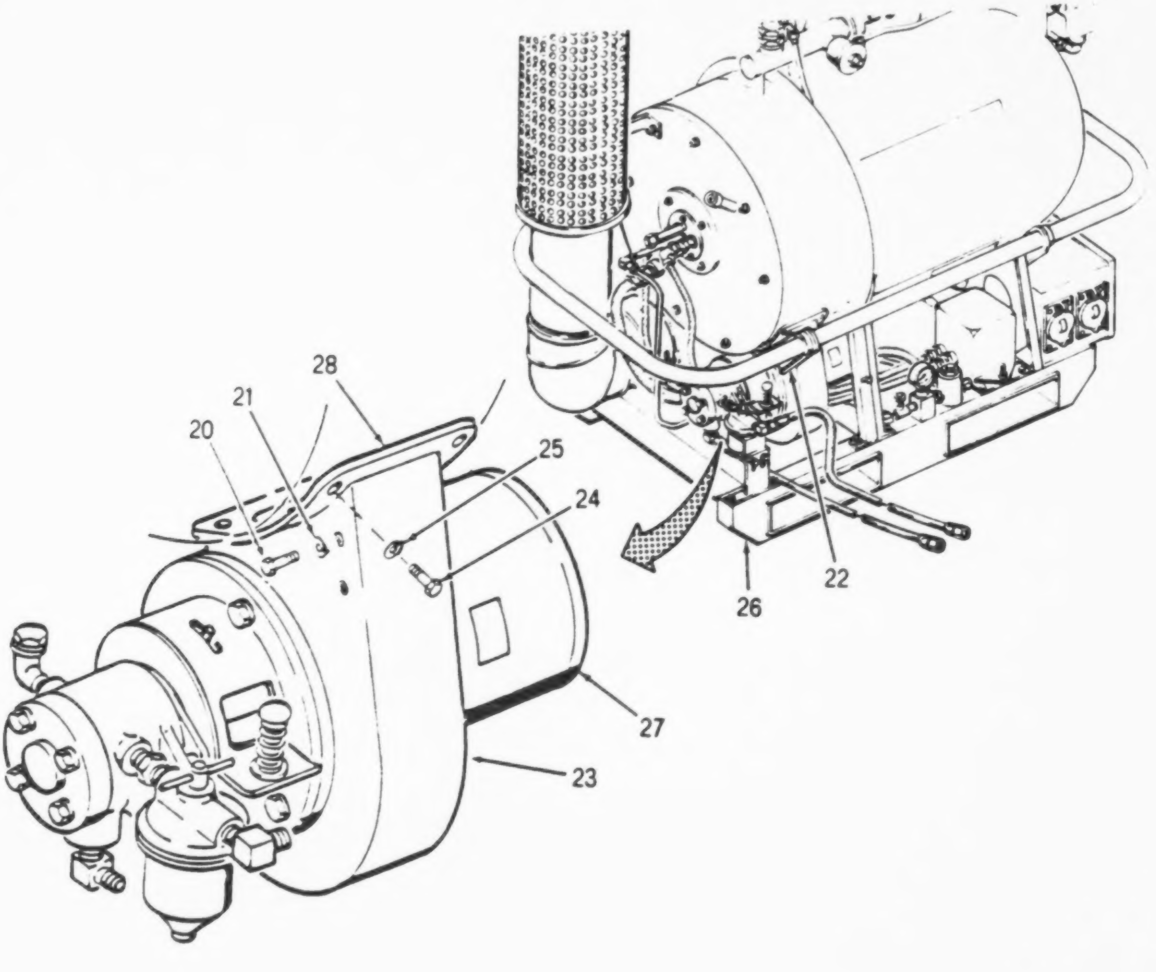
h. Blower Assembly (Cont'd)

9. Remove two capscrews (20) and lockwashers (21) securing handle assembly (22) to blower housing (23).

10. Remove six hex head screws (24) and lockwashers (25) holding blower housing (23) to water vessel (26).

11. Remove blower housing (23) with motor (27) attached from water heater.

12. Separate housing (23) from gasket (28).

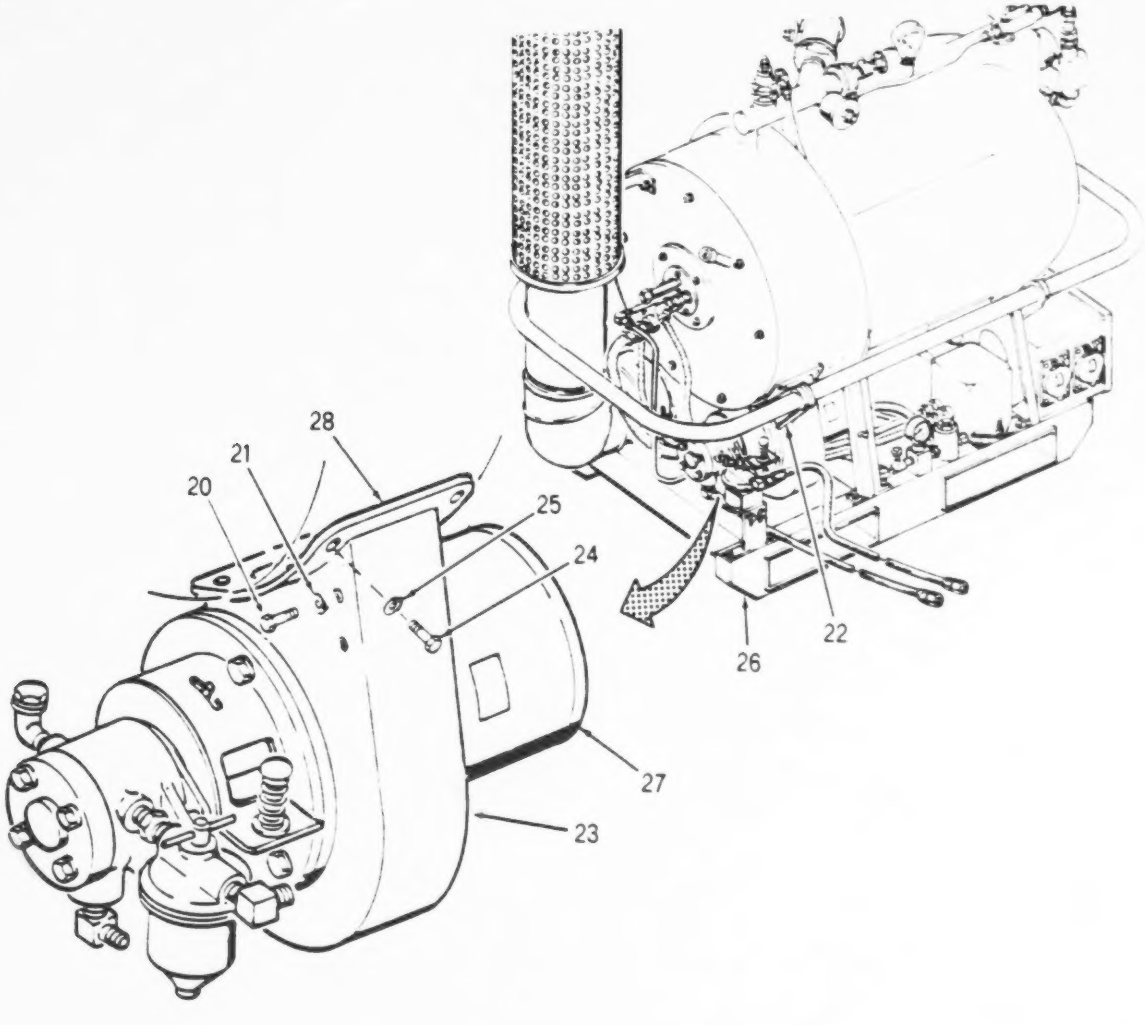


4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

h. Blower Assembly (Cont'd)

13. Place gasket (28) on blower assembly (23). Set blower assembly (23) in place on water vessel (26) and secure with six hex head screws (24) and six lockwashers (25).

14. Secure handle assembly (22) to blower housing (23) using two capscrews (20) and lockwashers (21).

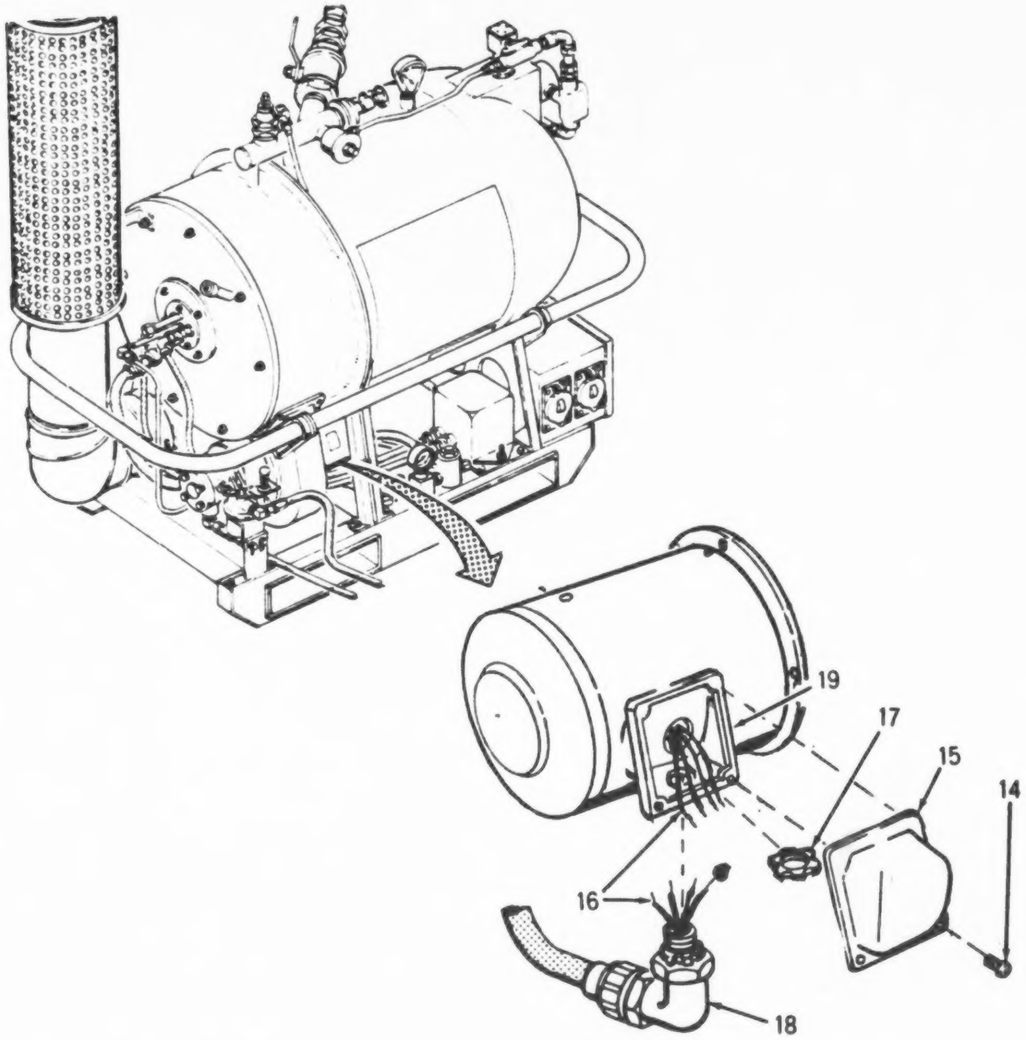


4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

h. Blower Assembly (Cont'd)

15. On back side of blower assembly, insert conduit connector (18) into junction box (19) and secure with nut (17).

16. Connect tagged wires (16). Install cover plate (15) using two screws (14).



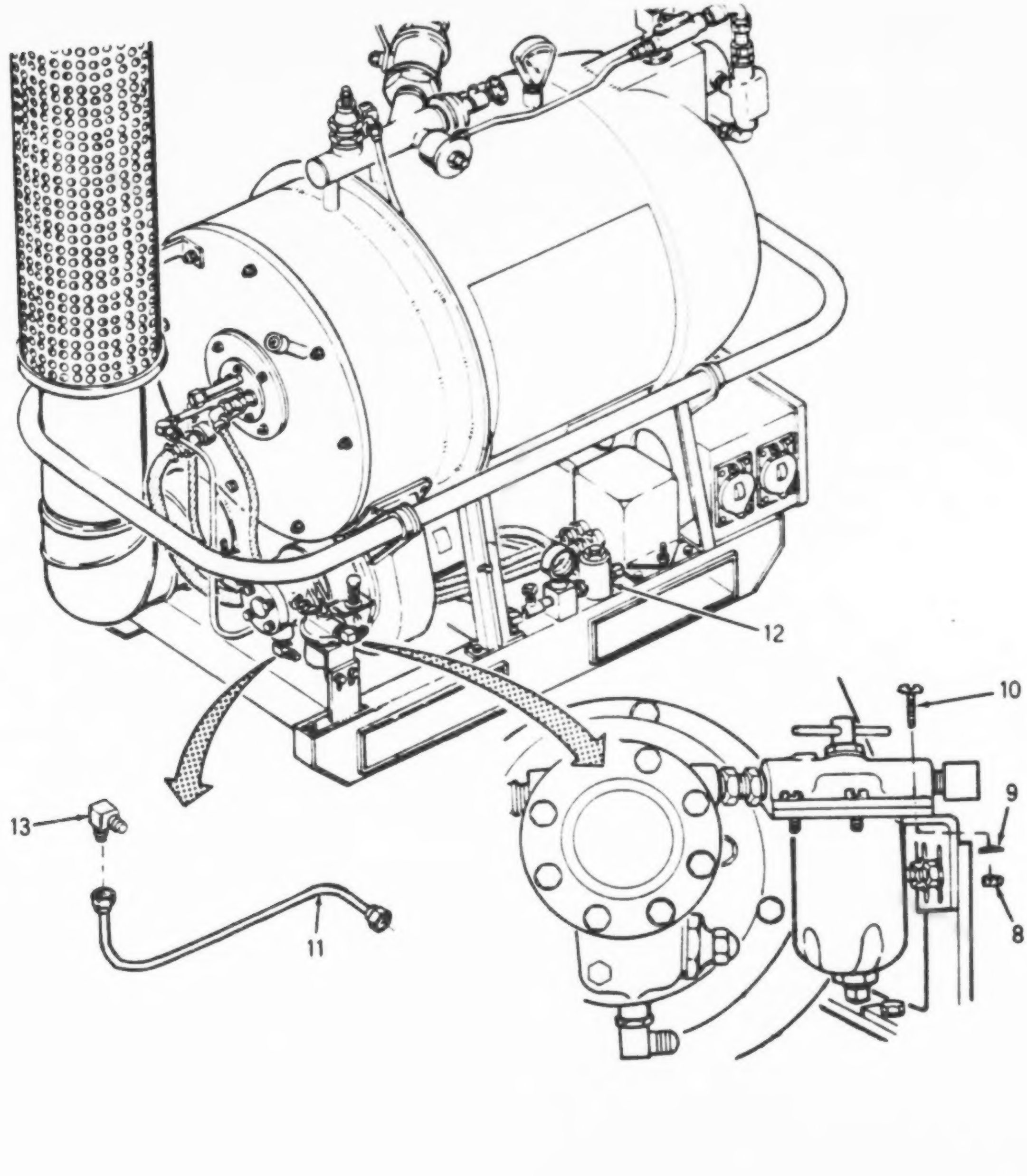
4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

h. Blower Assembly (Cont'd)

17. Connect elbow (13) to fuel pump.

18. Connect fuel line (11) from solenoid valve (12) to elbow (13).

19. Install two screws (10), two washers (9), and two nuts (8).

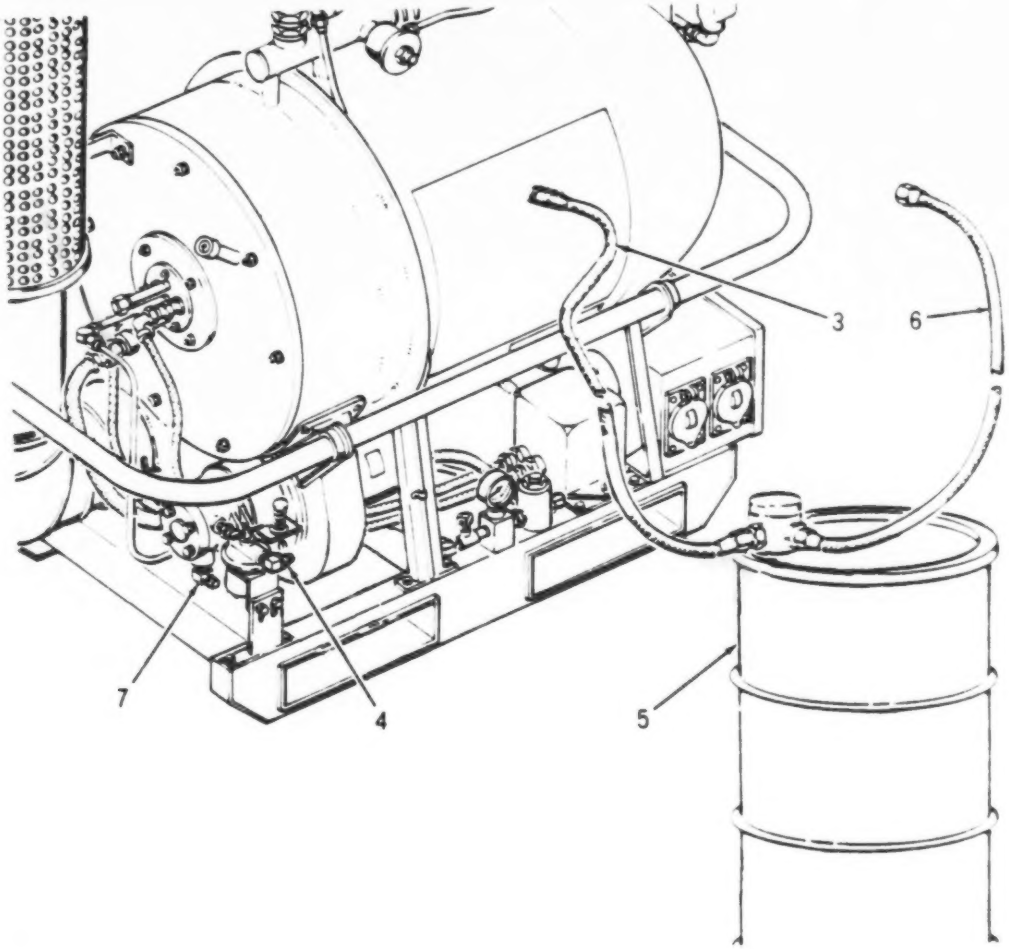


-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

h. Blower Assembly (Cont'd)

20. Connect fuel return hose (6) to elbow (7) and connect fuel line (3) to elbow (4).

21. Connect power plug disconnected in step 1.

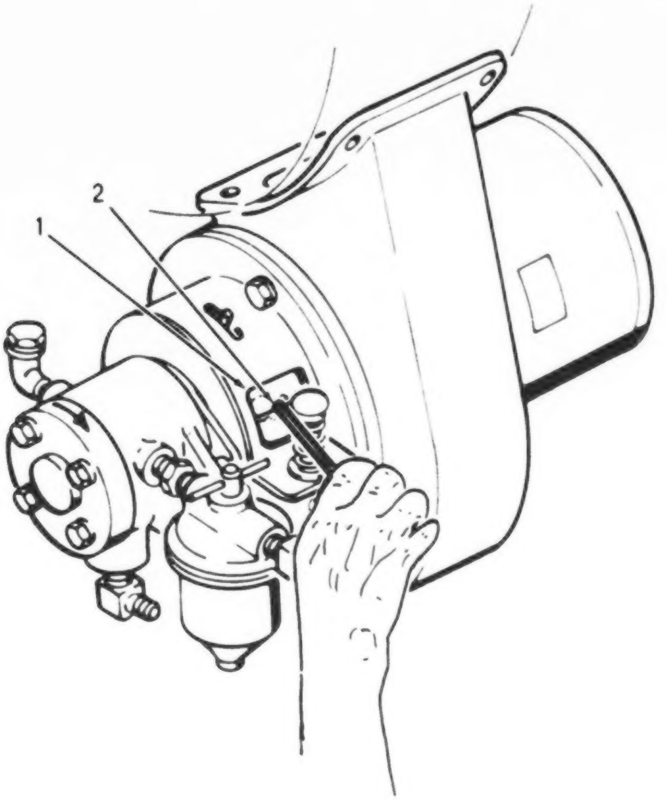


4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

i. Blower and Fuel Pump Motor. Use these procedures to replace the blower and fuel pump motor.

1. Remove blower assembly from water heater as in paragraph 4-14.i steps 1 through 11.

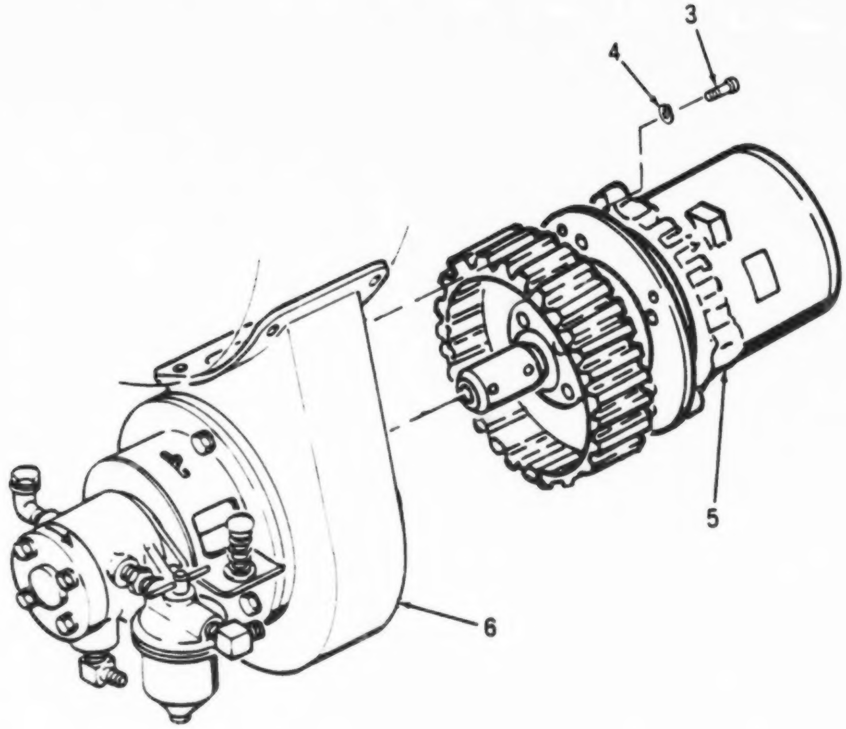
2. Reach through slot in shutter assembly (1) with Allen wrench and loosen setscrew (2) securing coupling to fuel pump shaft.



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

i. Blower and Fuel Pump Motor (Cont'd)

3. Remove four capscrews (3) and four lockwashers (4) and slide motor (5) out of housing (6).



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

i. Blower and Fuel Pump Motor (Cont'd)

4. Loosen setscrew (7) and remove coupling from shaft (8).

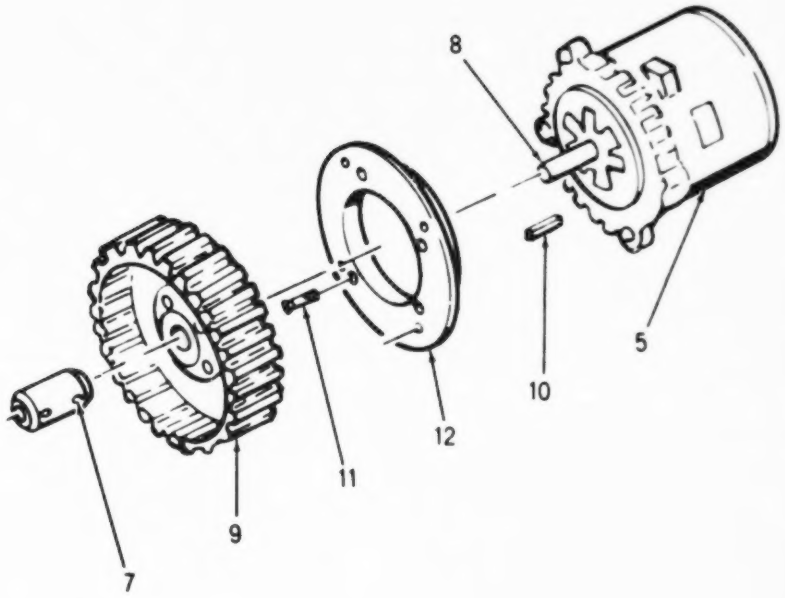
5. Carefully pry blower wheel (9) from motor shaft (8). Lift key (10) from blower shaft.

6. Remove four machine screws (11) securing mounting plate (12) to motor (5) and remove plate.

7. To install blower and fuel pump motor, set mounting plate (12) in place on motor (5) and secure with four machine screws (11).

8. Insert key (10) on motor shaft (8) and press blower wheel (9) on motor shaft.

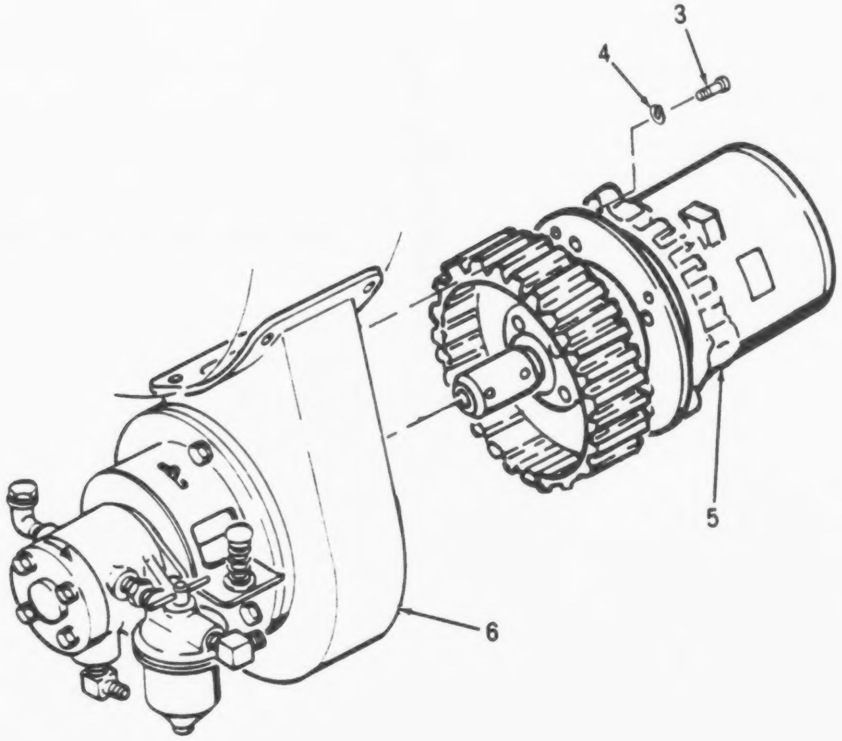
9. Install coupling and tighten setscrew (7).



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

i. Blower and Fuel Pump Motor (Cont'd)

10. Set motor (5) in place on blower assembly (6) and secure with four capscrews (3) and four lockwashers (4).

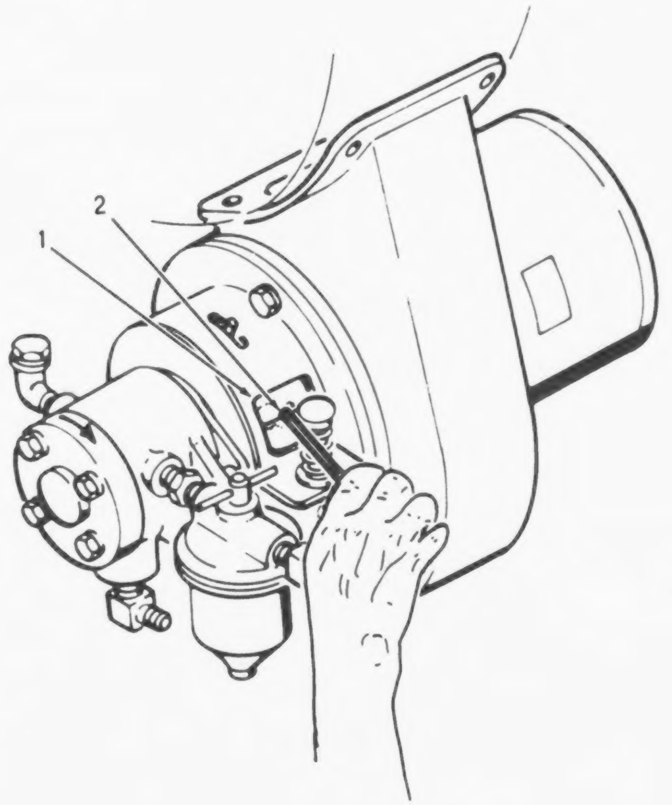


4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

i. Blower and Fuel Pump Motor (Cont'd)

11. Reach through slot in shutter assembly (1) with Allen wrench and tighten setscrew (2) to secure coupler to motor shaft.

12. Install blower assembly to water heater as in paragraph 4-14h steps 13 through 21.



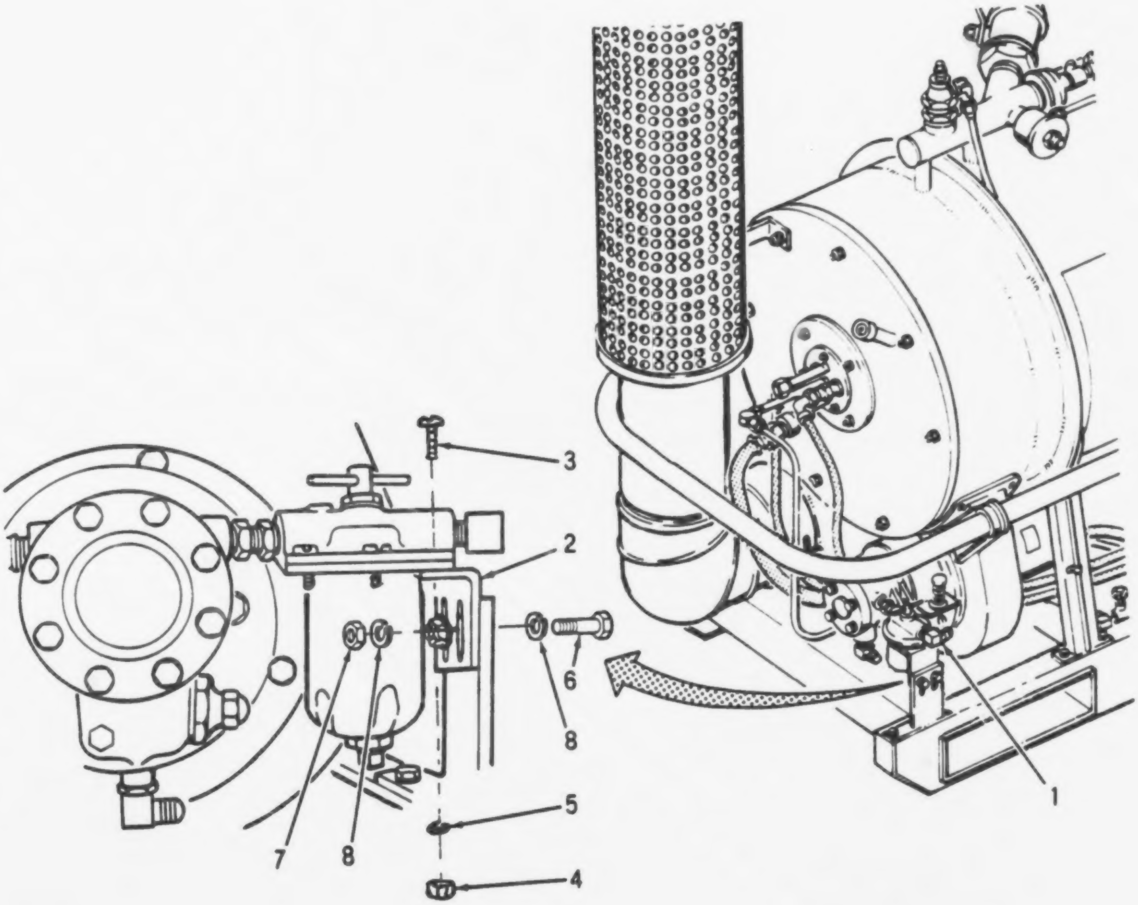
4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

j. Fuel Assembly Filter. After cleaning the filter by turning the control on top and the filter is still inoperative, replace the filter.

1. Remove power and disconnect fuel return hose as in paragraph 4-14h, steps 1 through 3.

2. Remove elbow (1).

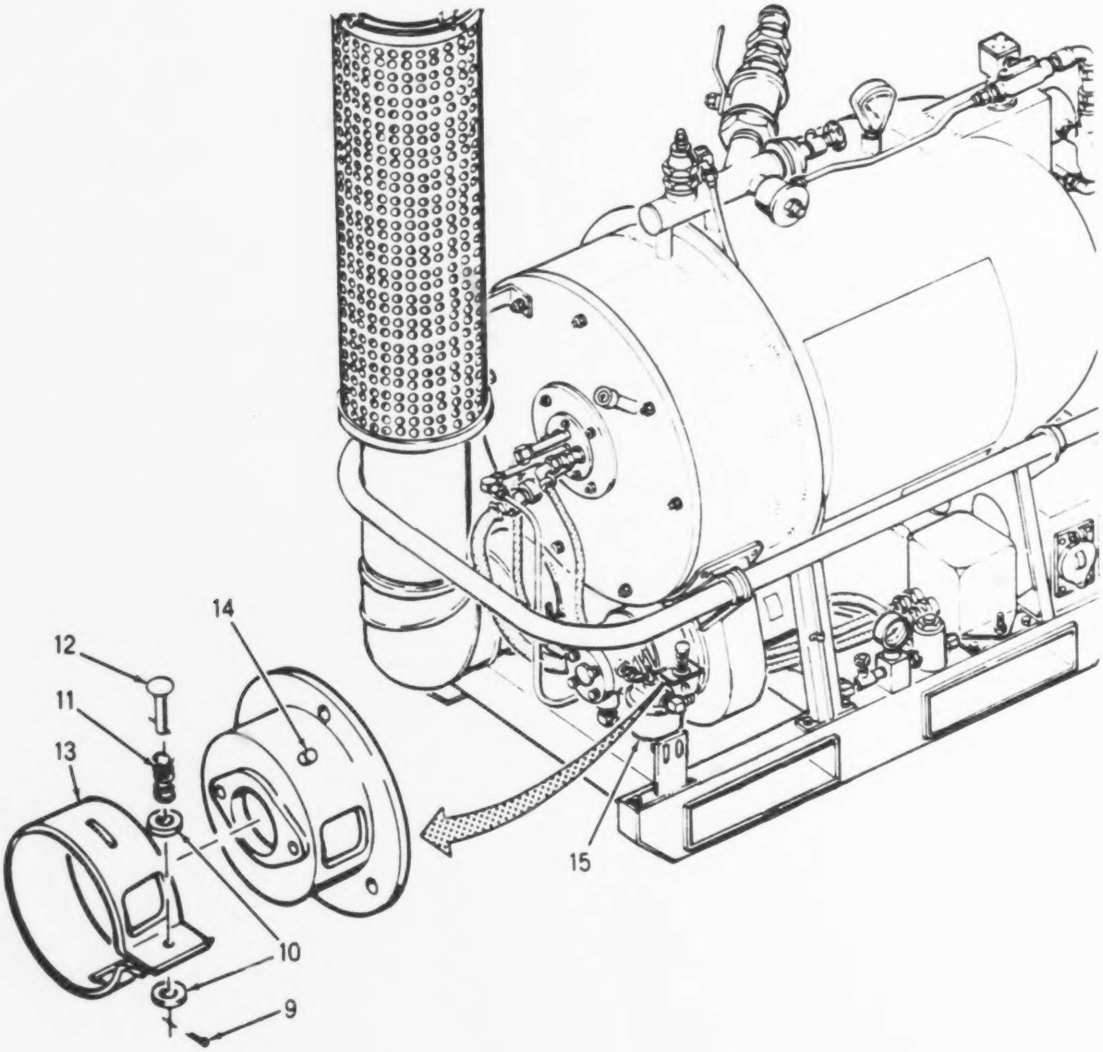
3. Remove fuel filter bracket (2) by removing two capscrews (3), two nuts (4), two washers (5), two capscrews (6), two nuts (7) and four washers (8).



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

j. Fuel Filter (Cont'd)

4. Remove cotter pin (9), two flat washers (10), spring (11), and rivet (12) and rotate air band (13) upward past stop (14) to clear fuel filter (15).

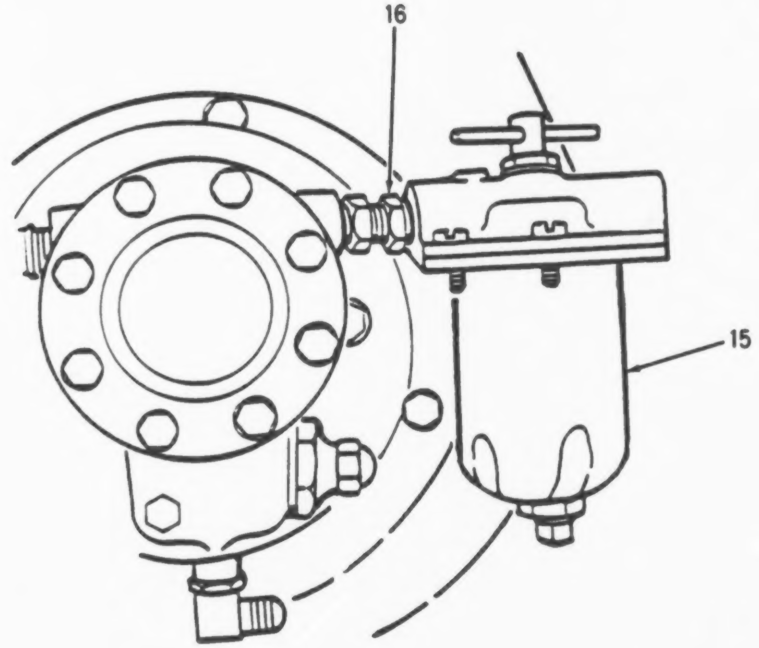


4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

j. Fuel Filter (Cont'd)

5. Unscrew fuel filter (15) from nipple (16) by turning counterclockwise.

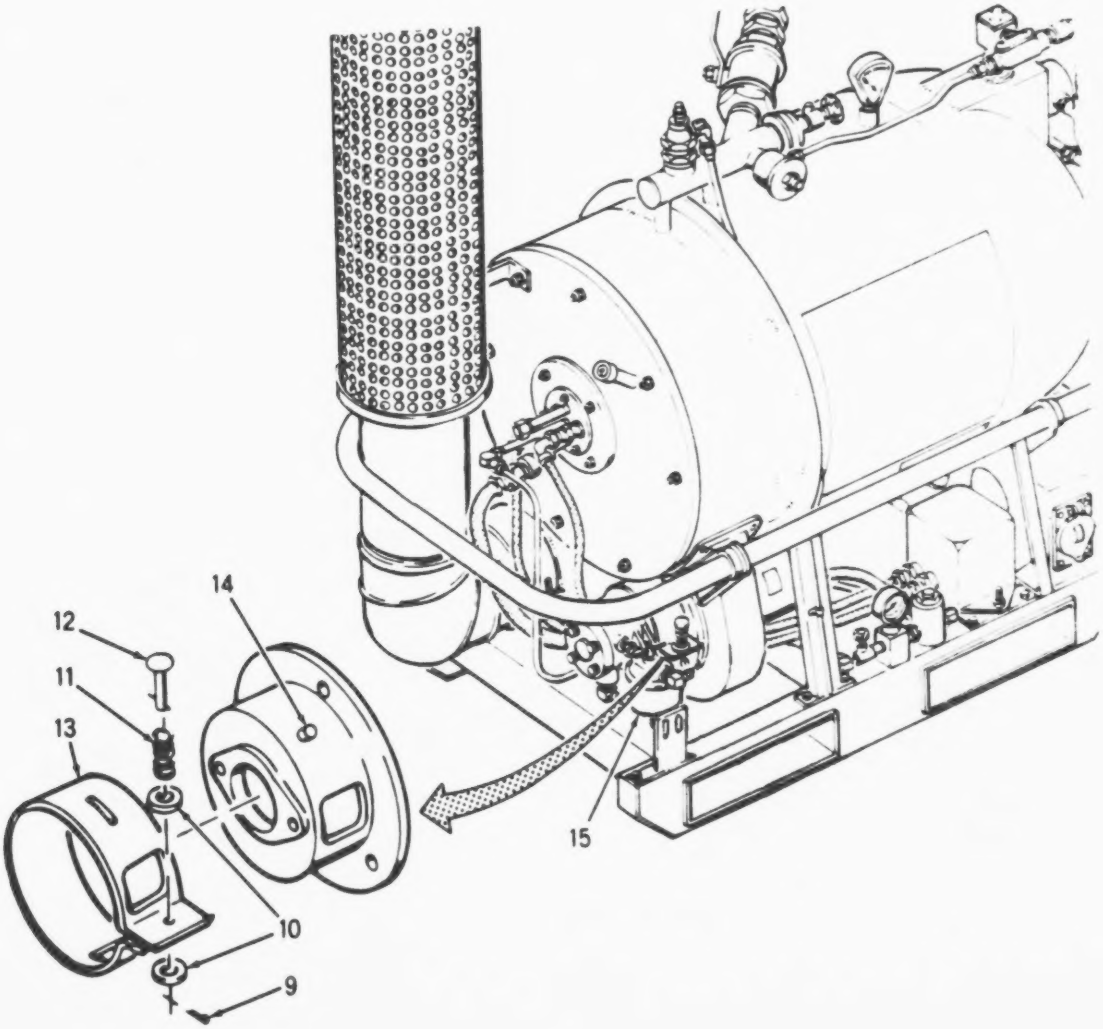
6. To install fuel filter, join filter (15) to nipple (16) and turn clockwise until tight.



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

j. Fuel Filter (Cont'd)

7. Rotate air band (13) until stop (14) is in slot. Install rivet (12), spring (11), two washers (10) and cotter pin (9).



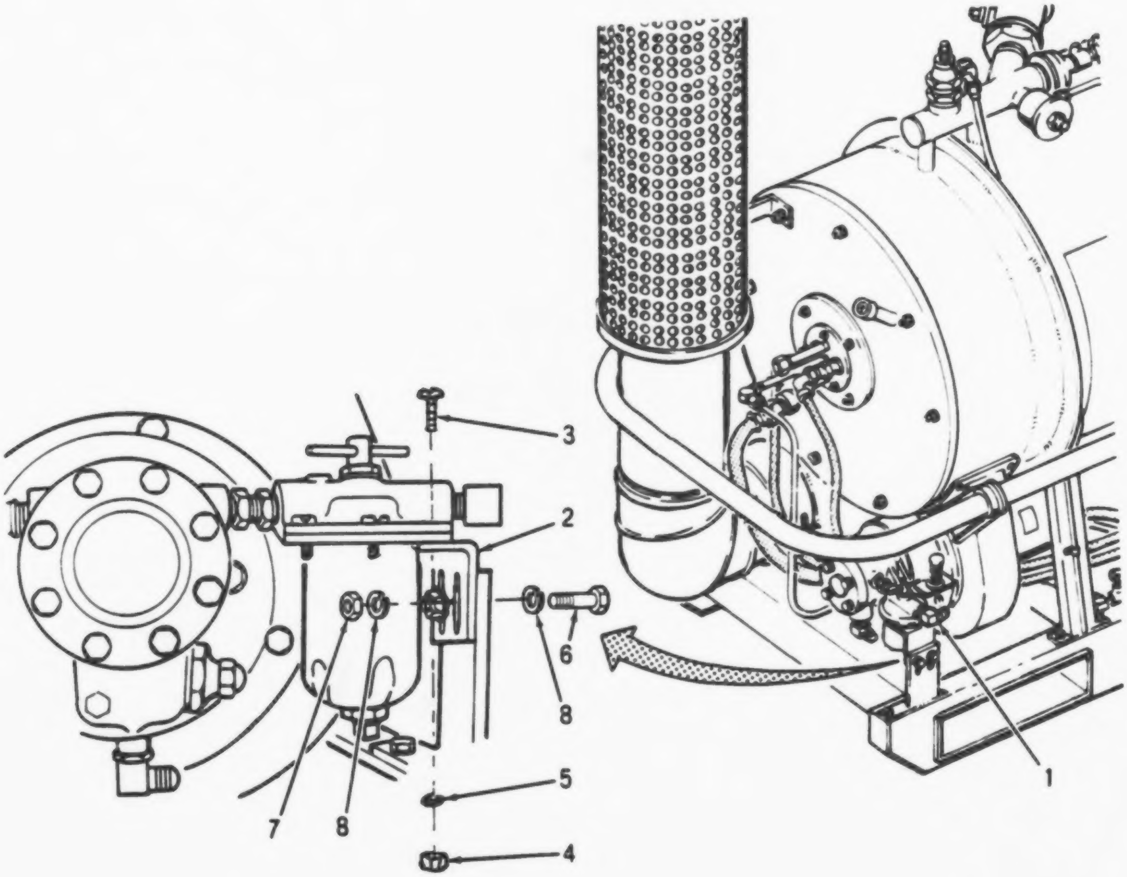
4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

j. Fuel Filter (Cont'd)

8. Install fuel filter bracket (2) using two capscrews (6), four washers (8) and two nuts (7). Position bracket under fuel filter such that it firmly supports filter before tightening screws. Install two screws (3), two nuts (4) and two washers (5).

9. Install elbow (1).

10. Connect fuel return hose and connect power connector as in paragraph 4-14h steps 18 and 19.



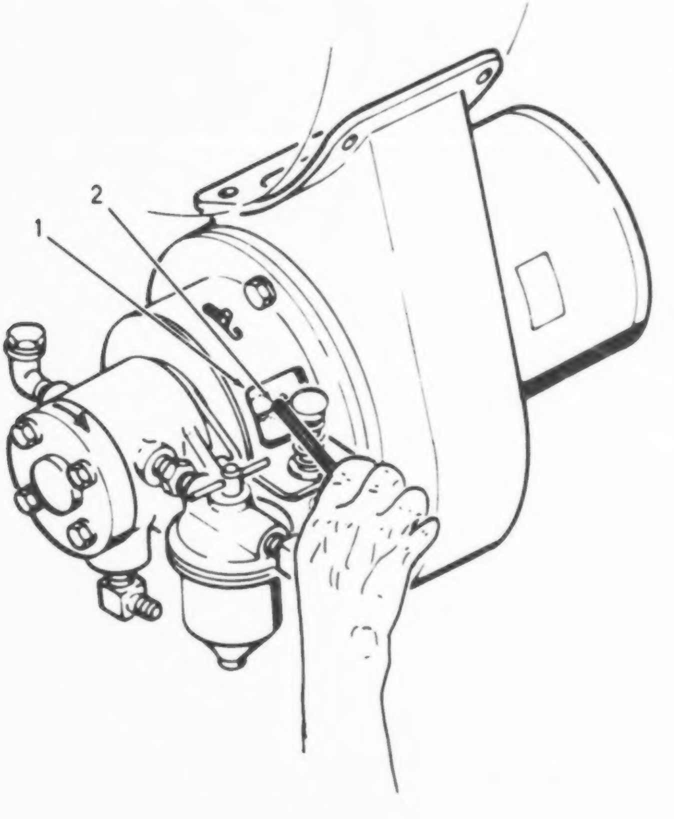
4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

k. Fuel Pump. Use these procedures to replace and adjust the fuel pump.

1. Remove power and disconnect fuel hoses as in paragraph 4-14.i steps 1 through 5.

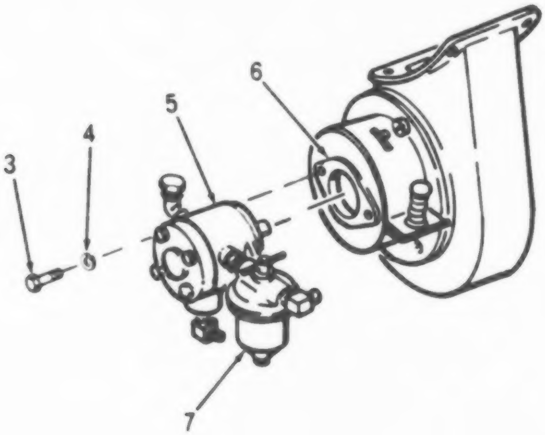
2. Remove fuel filter bracket as in paragraph 4-14j, step 3.

3. Reach through slot in shutter assembly (1) with allen wrench and loosen setscrew (2) securing coupling to fuel pump shaft.



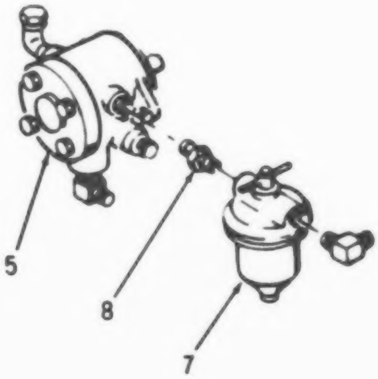
k. Fuel Pump (Cont'd)

4. Remove two hex head screws (3) and two lockwashers (4) securing fuel pump (5) to shutter assembly (6) and remove fuel pump and fuel filter (7).



5. Unscrew and remove fuel filter (7) and reducer nipple (8) from fuel

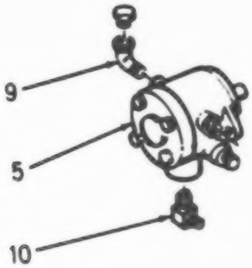
5. Unscrew and remove fuel filter (7) and reducer nipple (8) from fuel pump (5).



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

k. Fuel Pump (Cont'd)

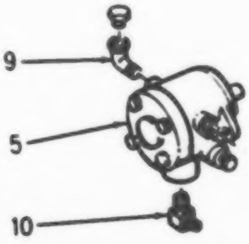
6. Remove elbow (9) and elbow (10) from fuel pump (5).



NOTE

Replacement fuel pump may have pipe plugs installed to protect pump while in transit or storage. Remove pipe plugs from replacement pump and install them on defective pump to protect it from dirt and foreign matter.

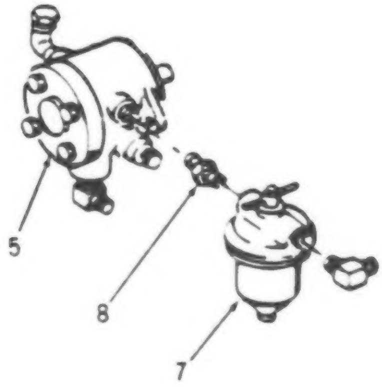
7. Install elbow (9) and elbow (10) on fuel pump (5).



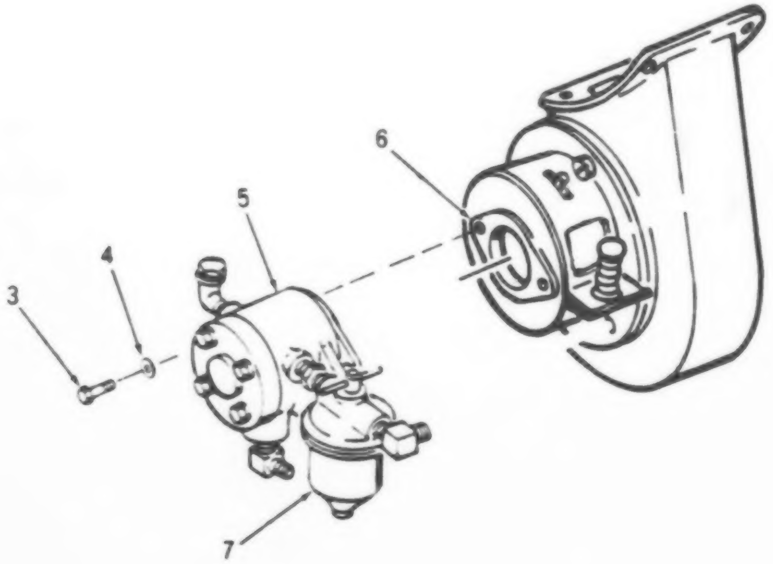
4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

k. Fuel Pump (Cont'd)

8. Install reducer nipple (8) and fuel filter (7) on fuel pump (5).



9. Set fuel pump (5) in place on shutter assembly (6) and secure with two hex head screws (3) and two lockwashers (4).



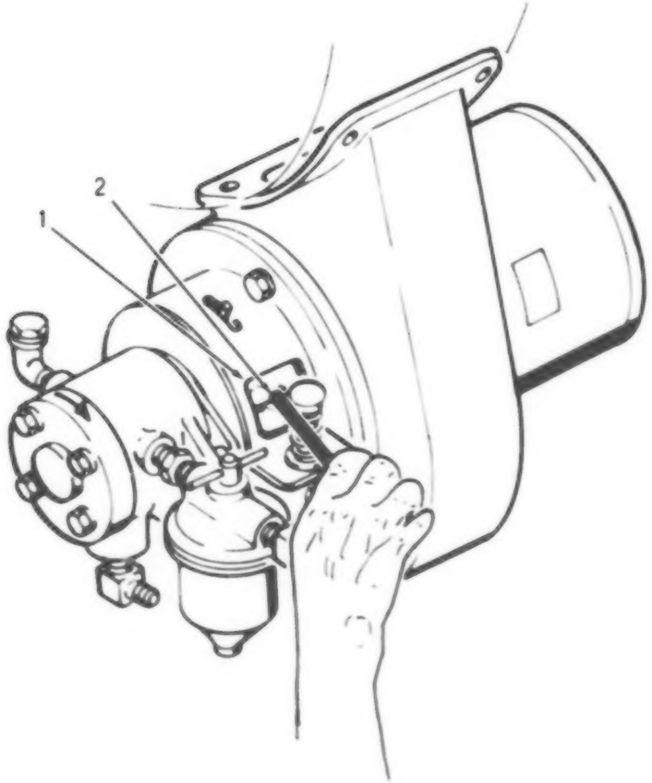
4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

k. Fuel Pump (Cont'd)

10. Reach through slot in shutter assembly (1) with Allen wrench and tighten setscrew (2) securing coupling to fuel pump shaft.

11. Replace fuel filter bracket as in paragraph 4-14j, step 8.

12. Connect fuel lines as in paragraph 4-14h, steps 18 through 20 and connect power cable.

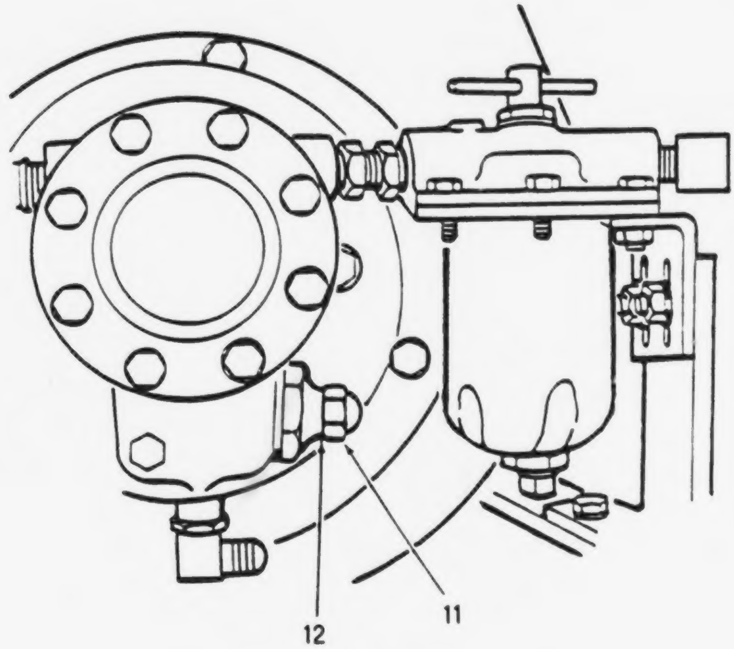


4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

k. Fuel Pump (Cont'd)

13. Turn on power limit switch and inspect water heater for normal operation. Check for fuel leaks and tighten any connection where leaks occur.

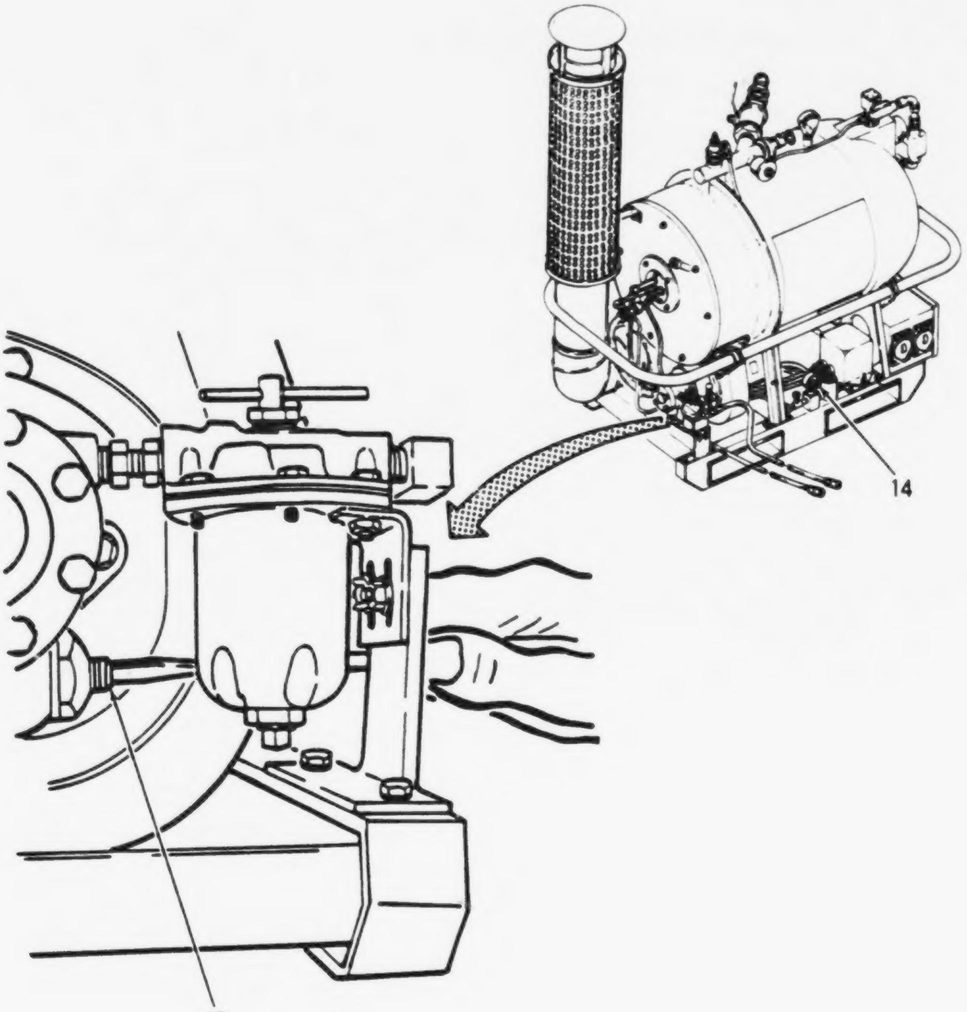
14. Remove end cap nut (11) and nut gasket (12) from side of fuel pump.



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

k. Fuel Pump (Cont'd)

15. Turn fuel pressure adjust screw (13) clockwise to increase and counterclockwise to decrease fuel pump pressure. Adjust until gage (14) reads 100 psi (690kPa).



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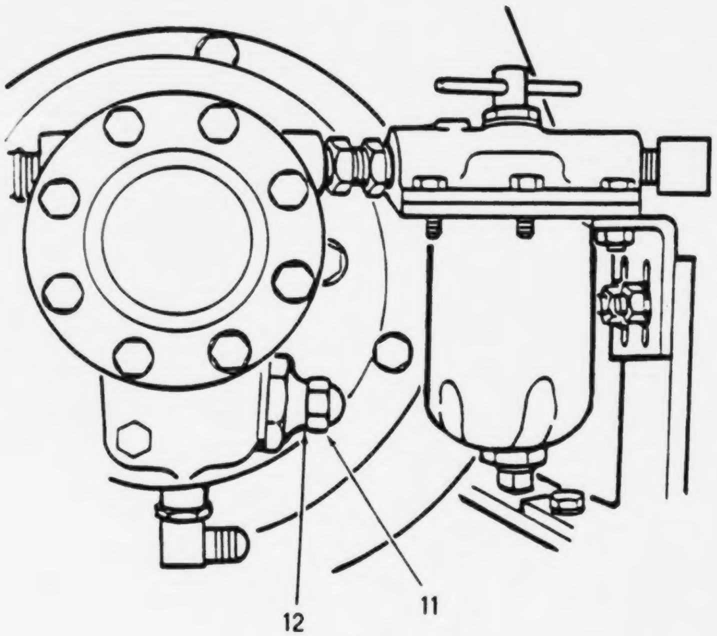
4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

k. Fuel Pump (Cont'd)

16. Replace end cap gasket (12) and end cap nut (11) on fuel pump.

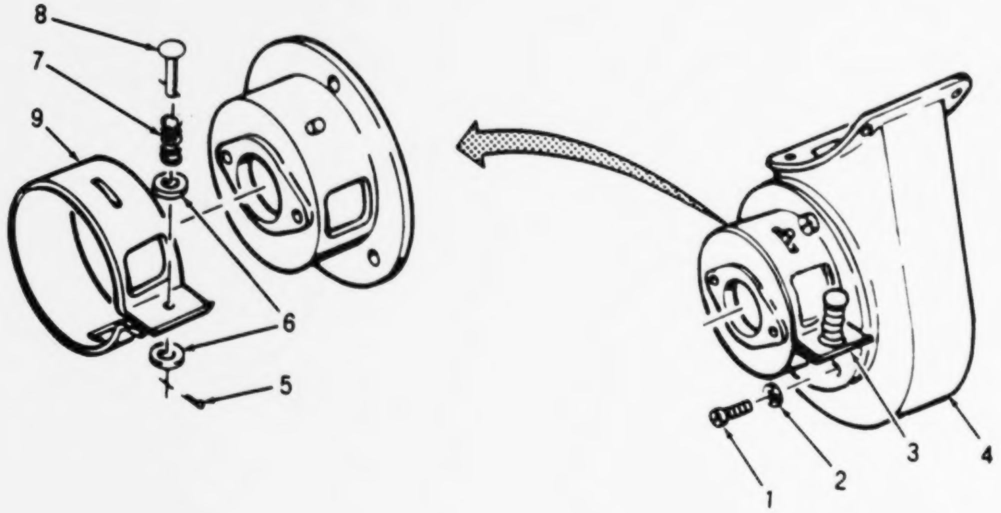
17. Turn off power limit switch.



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

l. Air Shutter Assembly. Replace parts of the air shutter if they become defective.

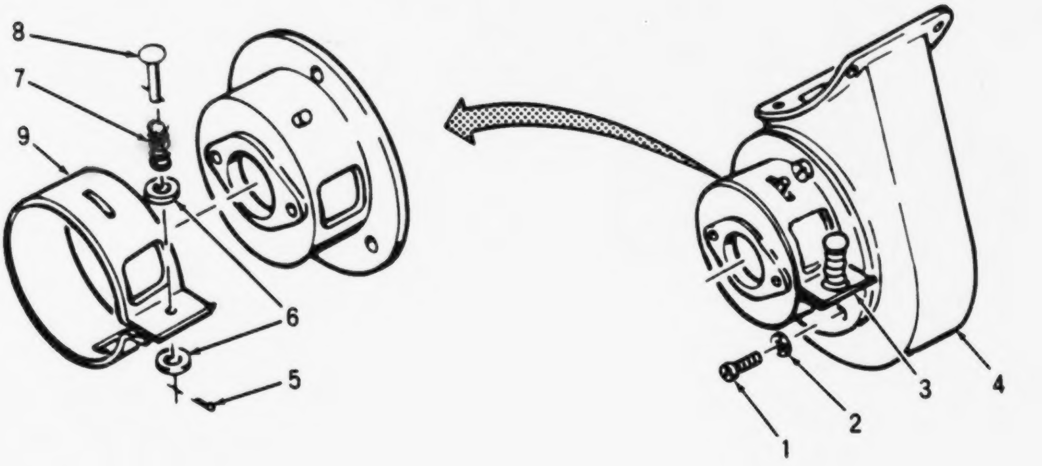
1. Remove power and disconnect fuel hoses as in paragraph 4-14h steps 1 through 5.
2. Remove fuel pump and filter assembly as in paragraph 4-14k step 3.
3. Remove three capscrews (1), three washers (2), and remove air shutter assembly (3) from blower (4).
4. Remove cotter pin (5), two washers (6), spring (7), rivet (8), and remove air band.



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

l. Air Shutter Assembly (Cont'd)

5. Place air band (9) over shutter (3) and secure with rivet (8), spring (7), two washers (6) and cotter pin (5).
6. Position air shutter assembly (3) on blower housing (4) and secure with three capscrews (1) and three washers (2).
7. Install fuel pump and filter assembly as in paragraph 4-14k, steps 8 and 9.
8. Connect fuel lines as in paragraph 4-14h, steps 18 through 20, and connect power cable.



4-14. WATER HEATER MAINTENANCE PROCEDURES (CONT'D)

m. Boiler Tank. Boiler tank maintenance consists of inspection, cleaning and touch-up paint if needed. Notify direct support maintenance if the boiler tank becomes defective.

1. Inspect smoke box cover gasket for breaks, burns, or damage.
2. Inspect tank for dents, breaks, cracks, and leaks. Make sure all weld spots are complete and unbroken.
3. Be sure upper and lower manifolds are welded securely to tank.
4. Clean tank outer surfaces with soapy water and let dry.
5. Prime exposed surface areas with primer (16, Appendix E). Apply one coat of enamel, color forest green, (item 17, Appendix E), per FED-STD-595.

NOTE

Do not paint the following areas:

a. Face of shower nozzles

b. Glass

c. Hose fittings

d. Decals

Section VI. PREPARATION FOR STORAGE OR SHIPMENT

4-15. PREPARATION FOR SHIPMENT OR LIMITED STORAGE

NOTE

Limited storage is that storage which does not exceed six months.

a. Inspection.

(1) Inspect Bath Unit for conditions such as dirt, oil, corrosion, missing items, and any signs of damage.

(2) Perform inspection procedures in the organizational preventive maintenance checks and services (PMCS), table 4-1.

b. Draining and Dismantling.

(1) Put oil in fuel pump according to the procedures in paragraphs 2-11g through 2-11k.

(2) Drain water from heater, water pump, and hoses (see paragraph 2-11).

(3) Dismantle the Bath Unit according to the procedures in paragraph 2-12.

c. Cleaning and Drying. Remove all contamination from components of Bath Unit by an approved method. Approved methods of cleaning and drying, the types of perservatives to be used, and the methods of applying the preservatives are described in TM 38-230.

d. Seal Openings. Seal ends of all hose assemblies and all openings on heater, water pump, and power source with pressure - sensitive tape conforming to specification (11, Appendix E).

NOTE

It is not necessary to crate the Bath Unit for storage that does not exceed six months.

4-16. PREPARATION FOR REGUALR STORAGE

NOTE

Regular storage is that storage which exceeds six months.

Preservation will be accomplished in a sequence that will not require operation of components preserved in paragraph 4-15 above. Perform procedures in paragraphs 4-15a and 4-15b.

a. Inspection.

(1) Inspect Bath Unit thoroughly to make certain it is in a servicable condition.

(2) Perform organizational preventive maintenance checks and services (PMCS), table 4-1.

(3) Correct all deficiencies.

b. Cleaning and Drying. Remove all contamination from Bath Unit by an approved method. Approved methods of cleaning, drying, types of perservative, and methods of application are described in TM 38-230.

c. Painting.

(1) Repaint all surfaces where paint has been damaged or removed. Refer to paragraph 4-14m, step 5.

(2) Apply a medium-grade protective lubricating oil to exposed, polished, or ground metal surface susceptible to corrosion or not otherwise protected.

d. Packing.

(1) Seal all openings on water heater, water pump, hoses, shower stands, and power source with pressure-sensitive tape. Spray with preservative compound.

(2) Wrap suction hose strainer, power source outlet box, and all repair parts and tools in barrier material and then seal them.

e. Placing Unit in Storage.

(1) Store the Bath Unit in a shelter, if possible, and cover it with a tarpaulin. The Bath Unit should be free of dust and moisture and easily accessible for inspection and maintenance. If it is impossible to store the Bath Unit in a shelter, select a firm, level, well-drained storage location, protected from prevailing winds, to store the Bath Unit.

(2) Position the Bath Unit (packed on baseboard) on heavy planking. Cover the Bath Unit with a tarpaulin or other suitable waterproof covering and secure it in a manner that will provide maximum protection from weather elements.

CHAPTER 5

DIRECT SUPPORT MAINTENANCE

This chapter contains information on the following:

Section I Repair Parts, Special Tools, Test, Measurement and Diagnostic Equipment (TMDE), and Support Equipment

II Direct Support Maintenance Procedures

Section I. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

5-1. COMMON TOOLS AND EQUIPMENT

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

5-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

No special tools, TMDE, or support equipment is required for the Bath Unit.

5-3. REPAIR PARTS

Repair parts are listed and illustrated in the Repair Parts and Special Tools List (TM 10-4510-206-24P, to be published) covering direct support maintenance for this equipment.

Section II. DIRECT SUPPORT MAINTENANCE PROCEDURES

5-4. GENERAL CLEANING INSTRUCTIONS

WARNING

Drycleaning solvent, P-D-680 (4, Appendix E) is potentially dangerous. Avoid repeated and prolonged breathing of vapors and skin contact with liquid. Do not use near open flame, arcing equipment, or other ignition sources. Use in well-ventilated area.

a. Metal Parts

(1) Prior to removal or disassembly of components, clean off excessive oil or dirt with a cleaning solvent (4, Appendix E), or steam clean.

(2) Use cleaning solvent (4, Appendix E), to clean parts such as housing and hand-packed bearings.

CAUTION

Do not immerse oil soaked bearings or sealed bearings in cleaning solvent. Clean with a cloth moistened with solvent.

(3) Use brushes to clean irregularly shaped surfaces. Use wooden pegs to clean ports and orifices. Use a lint-free cloth to wipe parts clean.

(4) Exercise care when handling machined and polished surfaces to avoid nicks and other damage. Do not immerse more than one metal machined part in solvent at a time, unless such parts are separated or protected from contacting each other.

b. Electrical Components

WARNING

Drycleaning solvent, P-D-680 (4, Appendix E) is potentially dangerous. Avoid repeated and prolonged breathing of vapors and skin contact with liquid. Do not use near open flame, arcing equipment, or other ignition sources. Use in well-ventilated area.

(1) Prior to removal or disassembly of electrical components, clean exterior by scraping off excess oil and dirt. Wipe with a clean, lint-free cloth dampened with cleaning solvent (4, Appendix E).

CAUTION

Do not immerse any electrical component or device in cleaning solvent.

WARNING

Safety glasses must be used when cleaning parts with compressed air.

(2) Clean armatures, coils, and solenoids with compressed air and wipe with a clean lint-free cloth dampened in cleaning solvent.

(3) Wipe electrical terminals with a clean, lint-free cloth dampened with cleaning solvent. Use a soldering iron to clean solder from terminals and connectors.

c. Gaskets, Seals, and O-Rings

(1) Clean all old gasket particles from mating surfaces.

(2) Discard and replace all gaskets, seals, O-rings, and flat washers.

5-5. GENERAL INSPECTION INSTRUCTIONS

a. General - Perform an inspection of all parts as soon as possible after cleaning. Instructions for specific inspection procedures are included throughout maintenance procedures for specific components.

b. Visual Inspection - Visually inspect all machined and polished areas. Use a strong light to shine across polished surfaces to inspect for scoring, cracks, breaks, or excessive wear.

c. Electric Parts

(1) Visually inspect wiring for frayed edges or damaged insulation.

(2) Inspect all electrical parts such as solenoids, with power applied, to observe actual operation.

5-6. GENERAL REPAIR INSTRUCTIONS

a. Thread Repair - Use the proper size tapping tool to repair tapped holes. Discard and replace all hardware that has defective threads.

b. Press Fit Parts

(1) Bearings may require the use of a pneumatic or hand-operated arbor press.

(2) Preheat all press-fit parts before reassembly. If necessary, use a lubricant to reduce abrasive action.

CAUTION

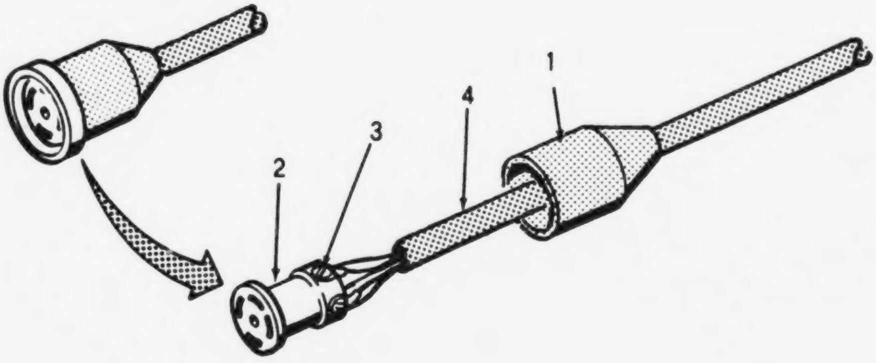
Do not press on the outer race of bearings when installing on shafts.

5-7. REPAIR PROCEDURES. The following tables are step-by-step instructions showing how to repair components of the Bath Unit. Repair the welded boiler tank and water heater skid and base assembly without removing more components than necessary to make the repair. The flame safeguard control and wiring, master control box assembly, and ignition transformer are tested or repaired while installed on the water heater. All other components of the Bath Unit needing repair are removed from the Bath Unit at the organizational maintenance level. Repair these components, make the necessary tests to ensure minimum performance and return the components to supply for further use.

5-7. REPAIR PROCEDURES (CONT'D)

a. Power Cable Assembly. The power cable assembly cables are terminated by male and female connectors and an electrolet box (T-junction). The procedures for repairing the male and female connectors are the same. The procedure for repairing a T-junction is different from repair procedures of the male and female connectors. Before attempting repair, determine which leg of the cable assembly is defective, and if possible, which wire is defective by inspection or continuity checks. Proceed as follows:

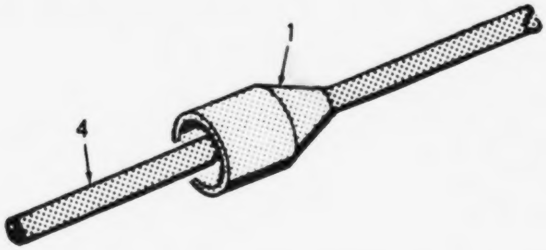
1. Peel back cap cover (1) from connector (2).
2. Inspect cable wires and connector for defects.
3. Remove connector by unscrewing five terminal screws (3).
4. Remove cap cover (1) from cable (4).



5-7. REPAIR PROCEDURES (CONT'D)

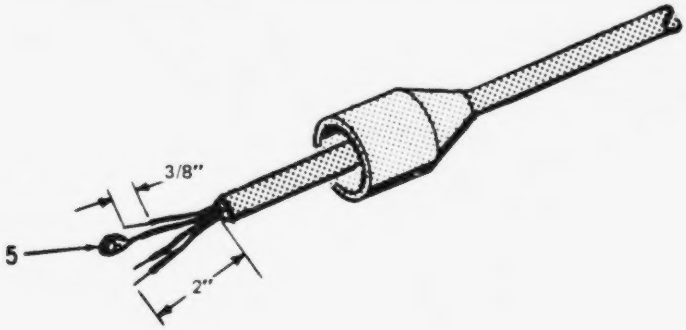
a. Power Cable Assembly (Cont'd)

5. Slip cap cover (1) onto replacement cable (4) of same length and trim wire ends to same length.

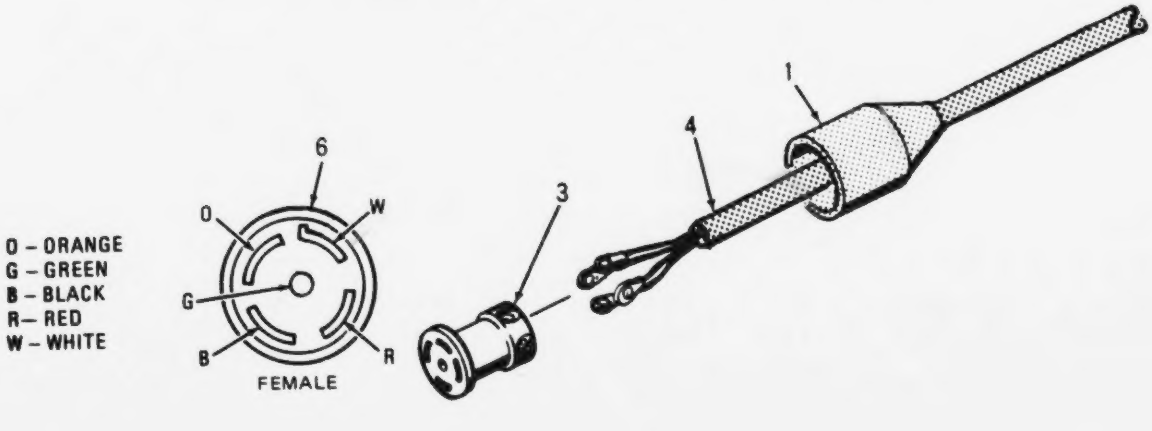


6. Cut outer insulation from cable 2-inches from end and trim approximately 3/8-inch insulation from tip of wire.

7. Crimp terminal lugs (5) to end of five wires.



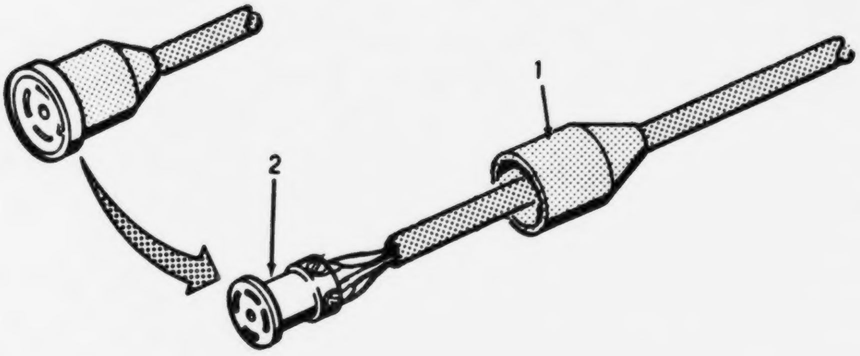
8. Connect terminal lugs (5) to connector using terminal screws (3) with wire colors keyed to connector terminals (6).



5-7. REPAIR PROCEDURES (CONT'D)

a. Power Cable Assembly (Cont'd)

9. Slide cap cover (1) over connector (2) until it seats.

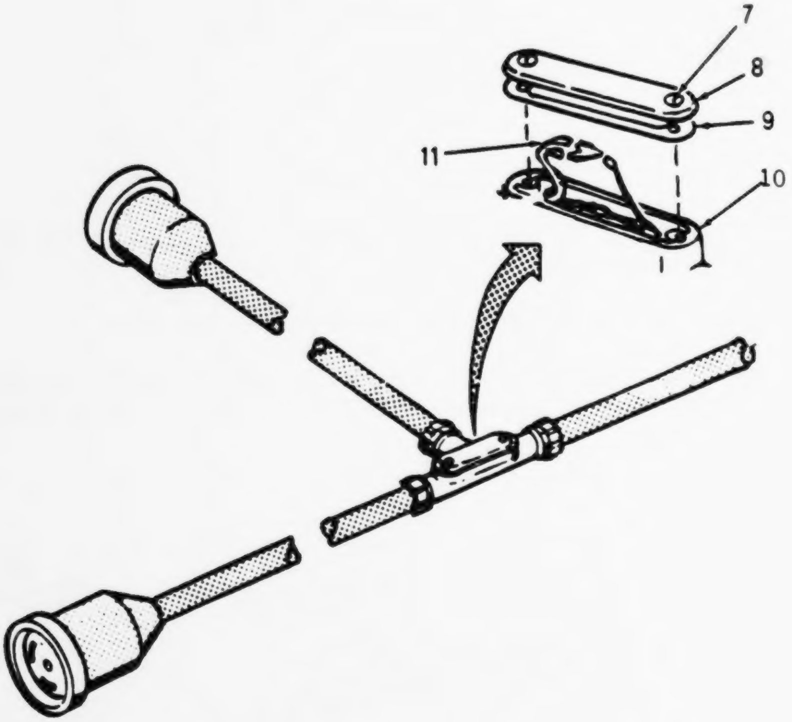


5-6. REPAIR PROCEDURES (CONT'D)

a. Power Cable Assembly (Cont'd)

10. To repair or replace cable at T-junction, remove two screws (7), cover (8), gasket (9) from electrolet box (10).

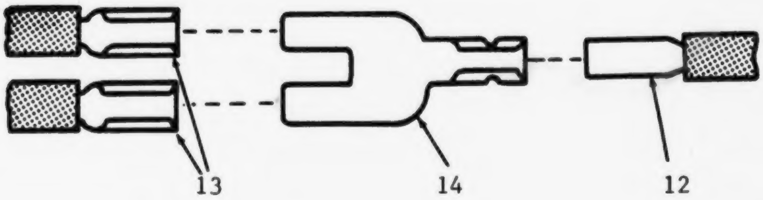
11. Cut heat shrink tubing (11) from T-junction.



5-7. REPAIR PROCEDURES (CONT'D)

a. Power Cable Assembly (Cont'd)

12. Disconnect defective cable at male (12) and female (13) disconnects and adapter (14).

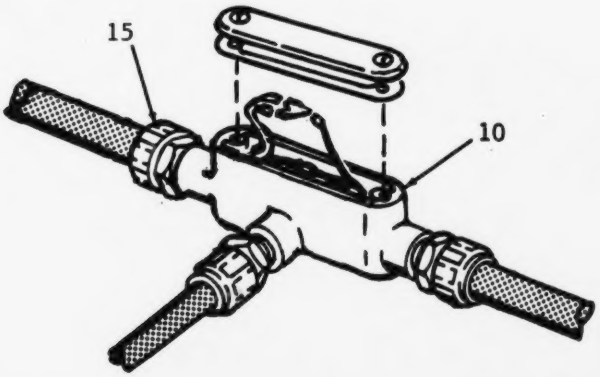


NOTE

Do not pull cable out of electrolet box unless it is necessary.

13. Pull defective cable from electrolet box.

14. If electrolet box (10) is defective, pull remaining cables out. Remove three watertight connectors (15) by turning counterclockwise.

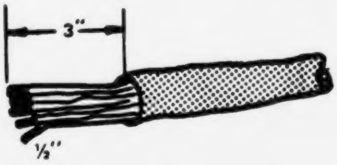


5-7. REPAIR PROCEDURES (CONT'D)

a. Power Cable Assembly (Cont'd)

15. Cut replacement cable same length as old cable and trim approximately 3 inches (76mm) of outer insulation back from end.

16. Trim approximately 1/2 inch (13mm) insulation from tip of wire and install either male or female disconnect to wire as necessary.



5-7. REPAIR PROCEDURES (CONT'D)

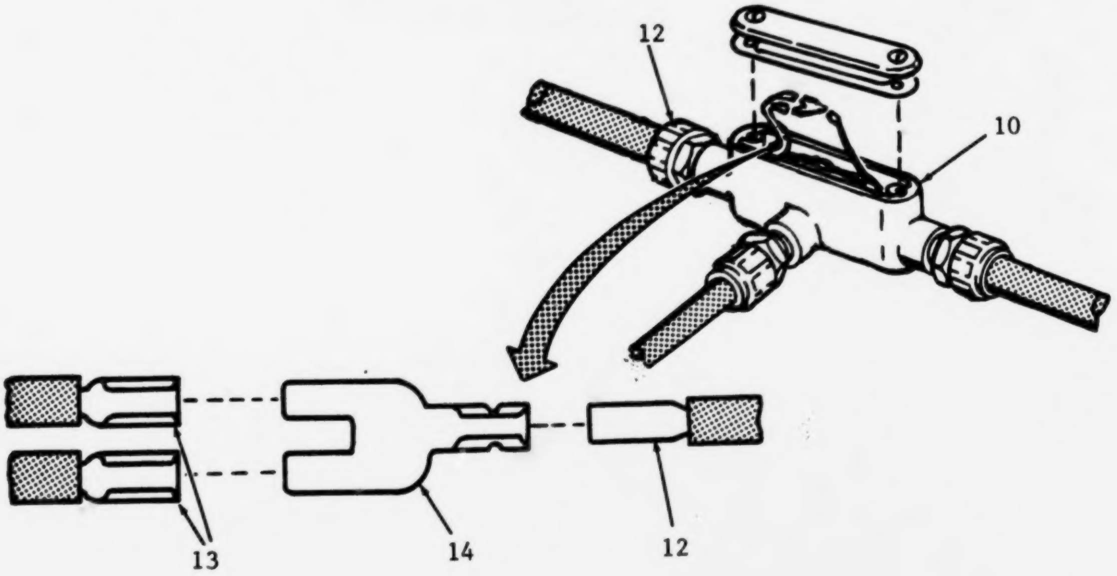
a. Power Cable Assembly (Cont'd)

17. Install watertight connectors (15) on electrolet box (10) if necessary and push cable end into electrolet box.

18. Cut heat shrink tubing 2-3/4 inch (70mm) long and place over end of wire.

19. Join male (12) and female (13) disconnects to adapter (14).

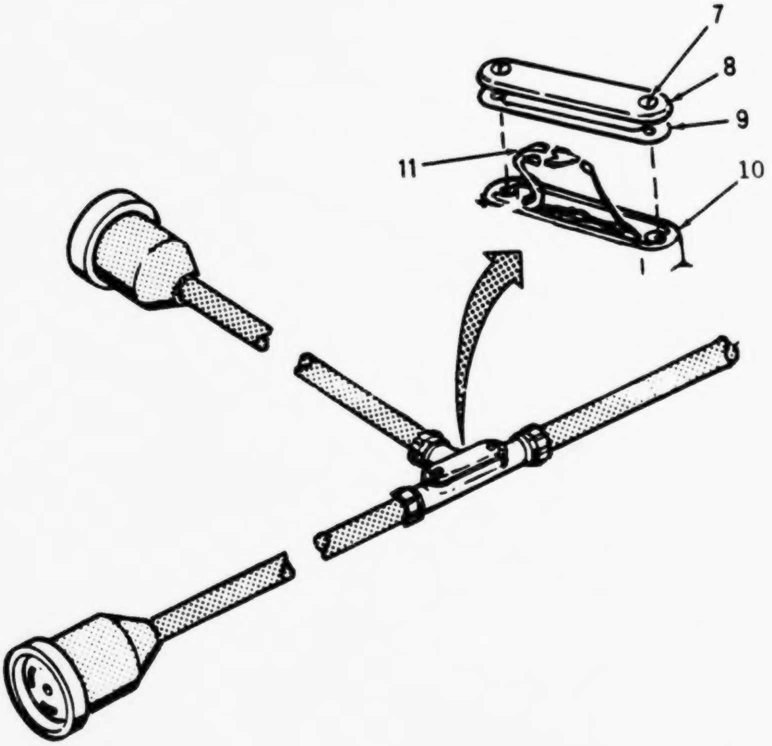
20. Pull heat shrink tubing over disconnects and apply heat to shrink tubing.



a. Power Cable Assembly (Cont'd)

21. Position wire junctions in electrolet box (10) to allow cover (8) to be installed.

22. Install cover (8) and gasket (9) on electrolet box (10) using two screws (7).

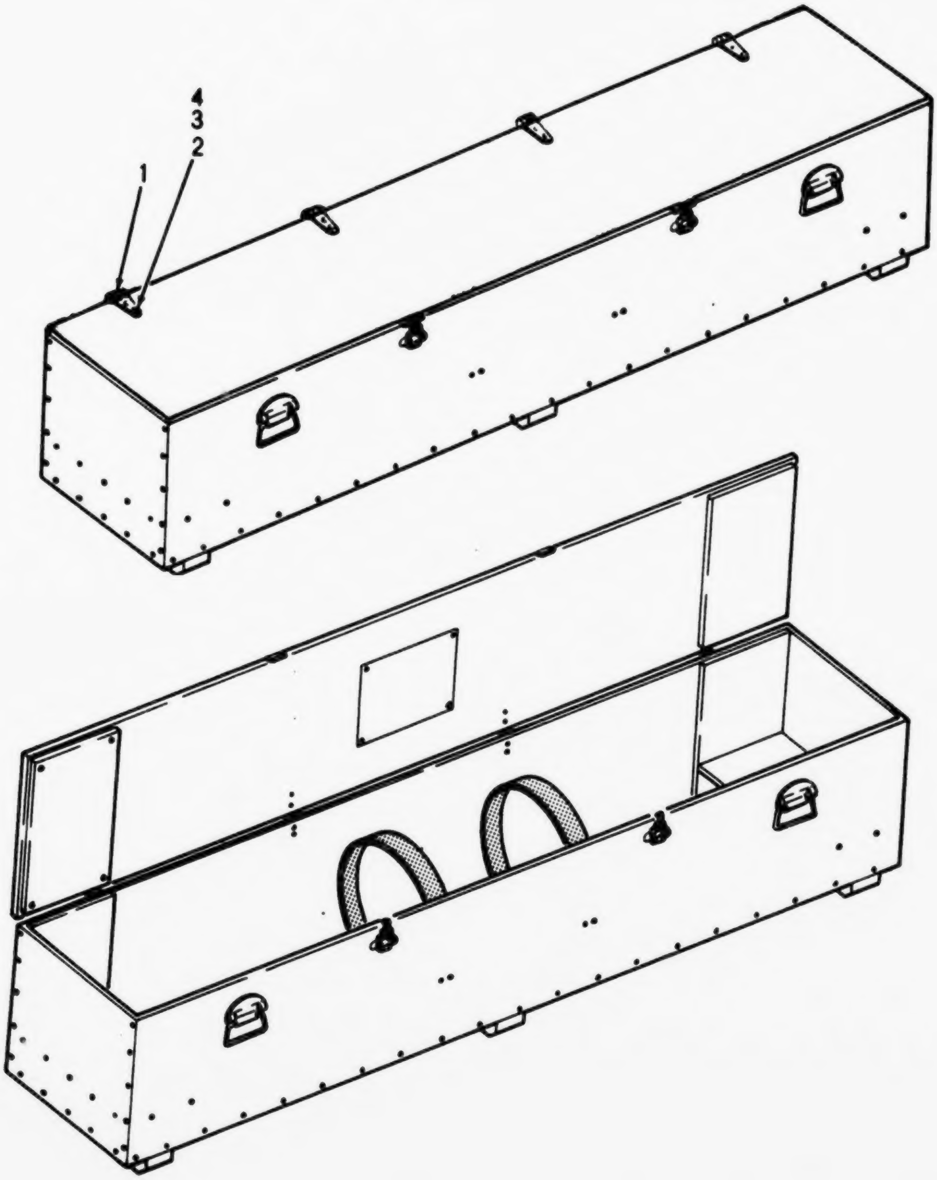


5-7. REPAIR PROCEDURES (CONT'D)

b. Shipping Containers. Shipping container repair is limited to replacement of fasteners (latches), hinges, carrying handles and painting. The repair instructions of one container is the same as for the other. Proceed as follows:

1. To remove a hinge (1) (container No. 2 only), remove six nuts (3), six washers (2), and six screws (4).

2. Install hinge (1) using six screws (4), six washers (2) and six nuts (3).



5-7. REPAIR PROCEDURES (CONT'D)

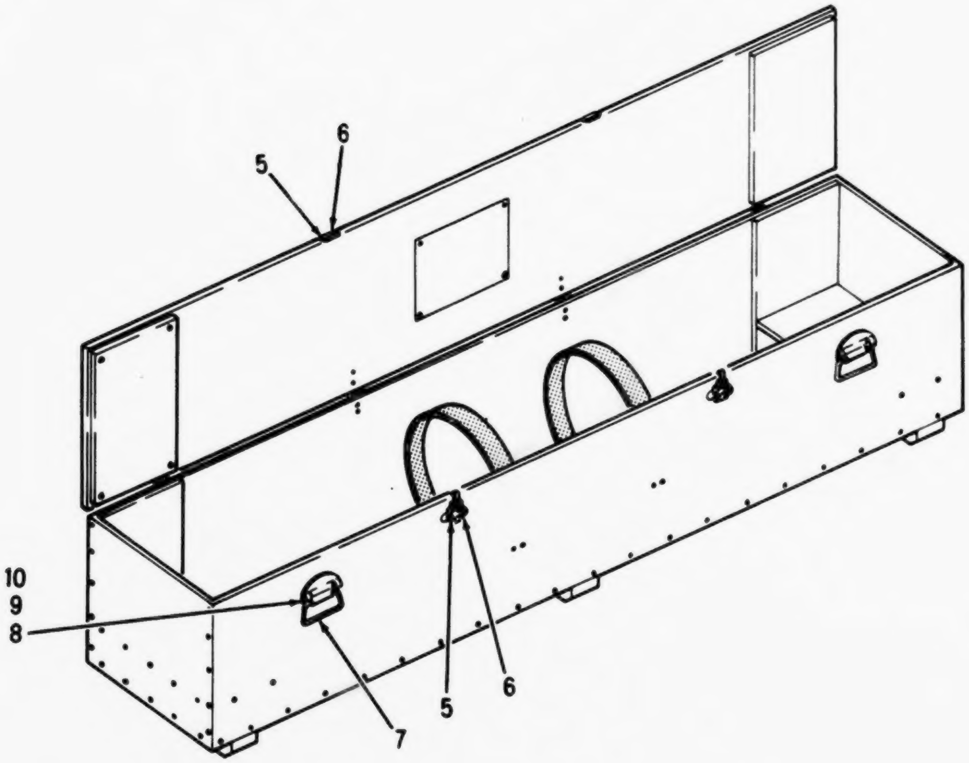
b. Shipping Containers (Cont'd)

3. To remove latch and strike assembly (5), remove two screws (6) each.

4. Replace latch and strike assembly (5) using two screws each.

5. To remove handle (7), remove five nuts (10), five washers (9) and five screws (8).

6. Replace handle (7) using five screws (8), five washers (9), and five nuts (10).



5-7. REPAIR PROCEDURES (CONT'D)

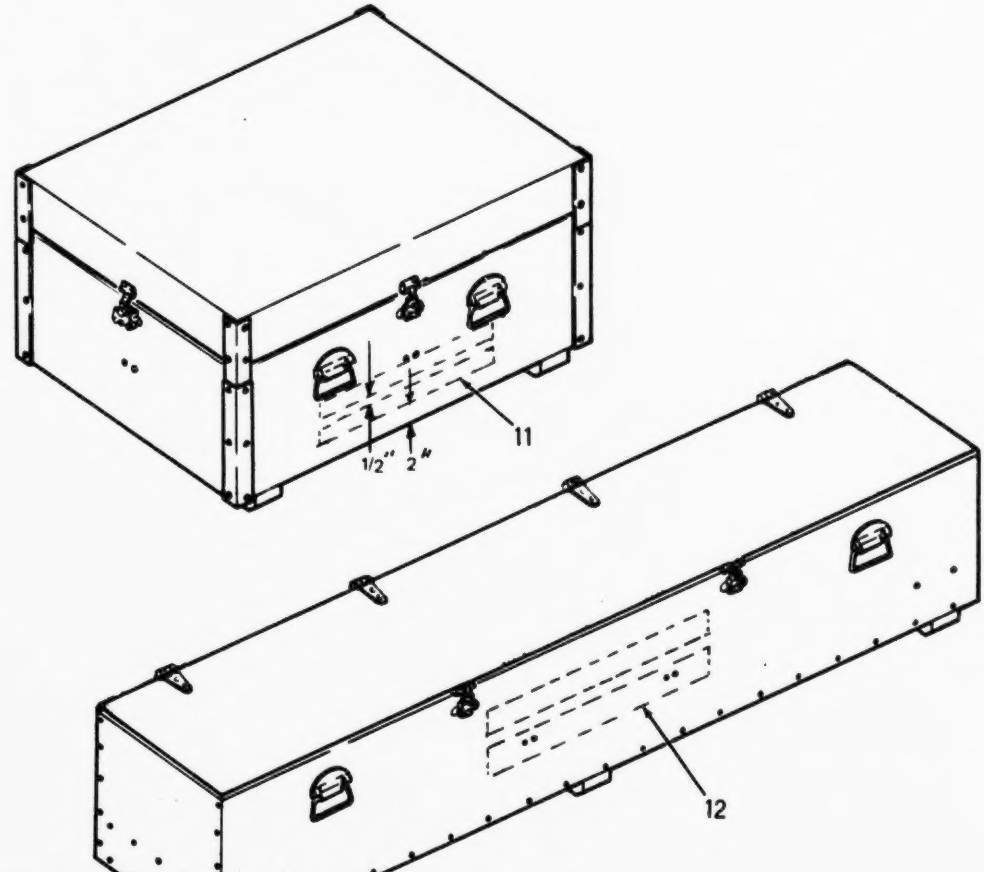
b. Shipping Containers (Cont'd)

7. Clean unpainted areas and apply one coat of primer TT-W-572 to wood surfaces and one coat of primer (16, Appendix E) to all metal surface.

8. Apply finish coat of enamel item 19, Appendix E, No. X24803 of FED-STD-595.

9. On container No. 1 stencil identification letters (11) two inches high in white per MIL-STD-130
   BATH UNIT AMH
   CONTAINER NO. 1.

10. On container No. 2 stencil identification letters (12) two inches high in white per MIL-STD-130
   BATH UNIT AMH
   CONTAINER NO. 2.



5-7. REPAIR PROCEDURES (CONT'D)

c. Shower Stand Assembly. Repair the shower stand by replacing all components except water flow control valve, shower nozzle and soap dish. Those components are repaired by organizational maintenance.

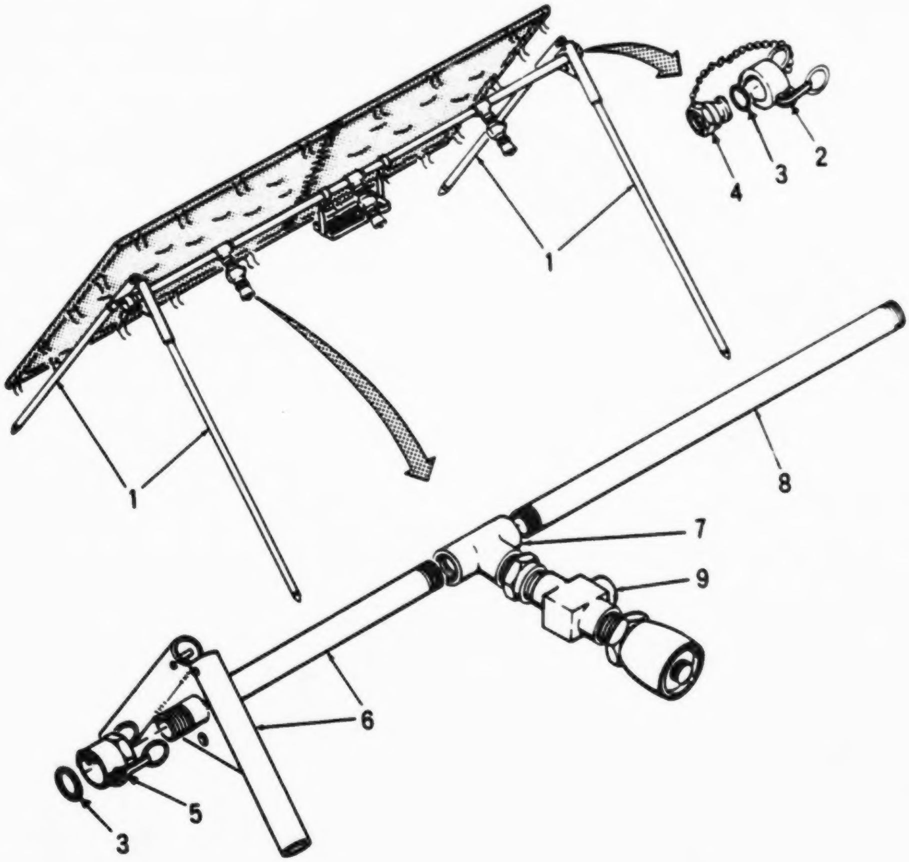
1. If legs (1) are slightly bent, straighten them. If legs are broken, replace.

2. Remove damaged half coupling cap (2) and gasket (3) and replace.

3. Unscrew half coupling (4 and 5) by turning counterclockwise.

4. Remove leg holder bracket (6) from tee (7) by turning counterclockwise.

5. Remove header pipe (8) by turning tee (7) on both ends counterclockwise.



5-7. REPAIR PROCEDURES (CONT'D)

c. Shower Stand Assembly (Cont'd)

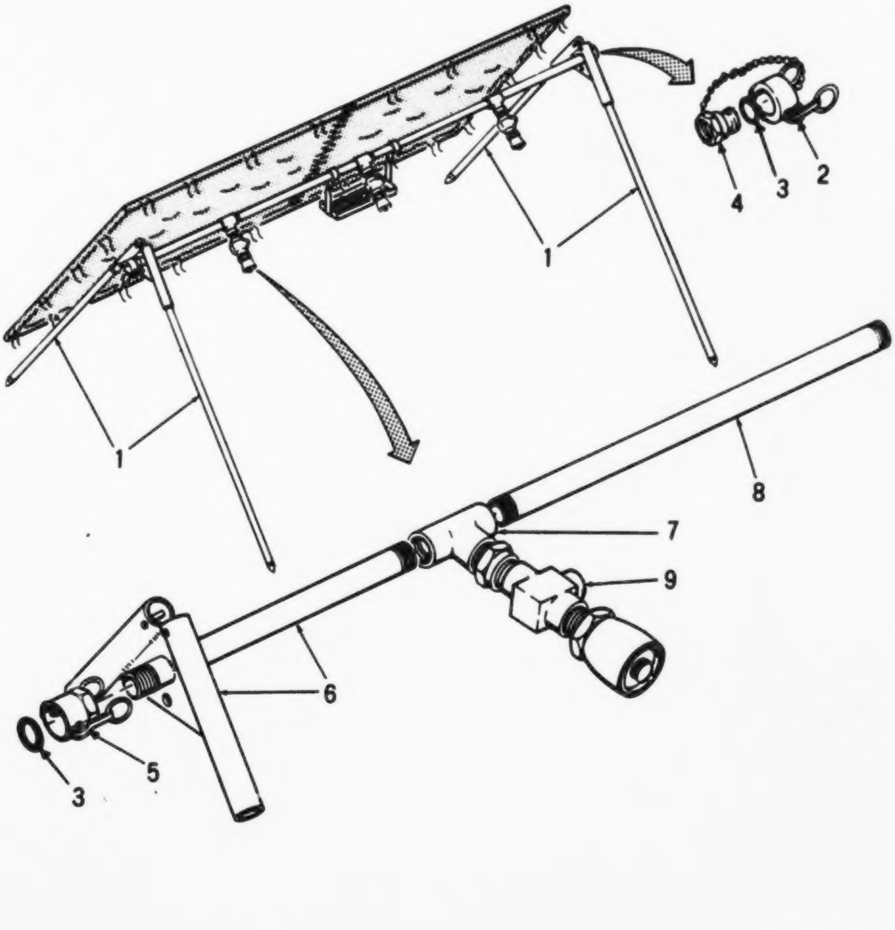
NOTE

Use pipe joint compound (14, Appendix E) when joining pipes and fittings.

6. Install header pipe (8) by attaching tee (7) to both ends and turning clockwise.

7. Install leg holder bracket (6) by attaching to tee (7) and turning clockwise. Leave shower nozzle and valve assembly (9) pointing downward 45° from horizontal.

8. Screw half coupling (4 or 5) and gasket (3) to leg holder bracket (6) by turning clockwise.



5-7. REPAIR PROCEDURES (CONT'D)

d. Shower Stand Windbreaker. The windbreaker may develop tears or rips from normal use. Repair using polyester thread conforming to V-T-285, Type I, Class 1, Subclass B, 005-1 (item 20, Appendix E). Make all stitching 1/8 inch (3mm) from edge or 1/8 inch (3mm) apart. Alternate repair method may use heat seal techniques.

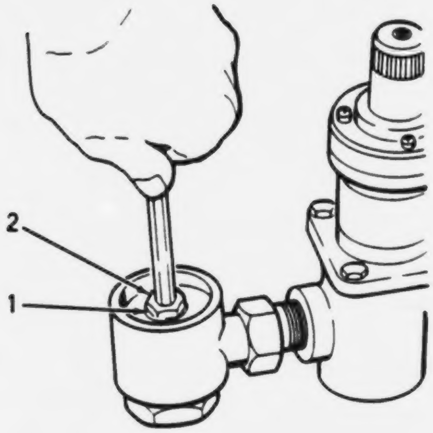
e. Mixing Valve Assembly. Common problems with the mixing valve assembly are clogged filter screens, and deposit buildup in the mixer. These problems can be fixed by a general cleaning of filters and internal parts. When parts replacement is called for, the replacement parts are usually part of a kit. Use all parts of the kit to replace the old parts. Consult the table below for a guide to kit replacement.

SYMPTOM	REMEDY	KIT
Discharge water has wide variations of temperature. Water flow is cut off.	Motor replacement	390-295
Water leaks at body gaskets.	Gasket and disk replacement	390-294
Discharge temperature varies after motor replacement (First check pressure drop across mixer).	Mixing valve replacement	390-297

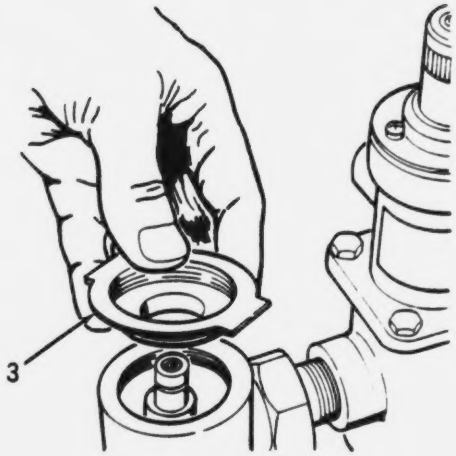
5-7. REPAIR PROCEDURES (CONT'D)

e. Mixing Valve Assembly (Cont'd)

1. Close both inlet checkstop valves (1) by turning stop valve stem (2) clockwise with a 1/4-inch key.



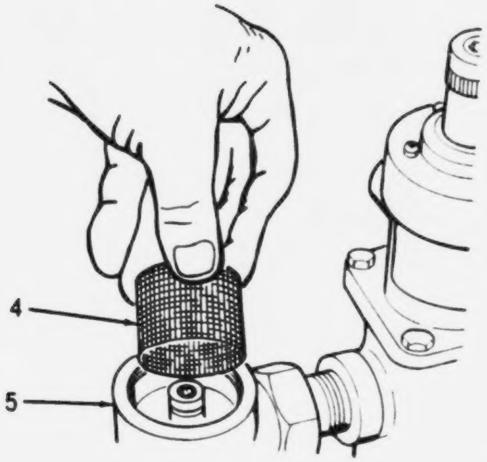
2. Remove bonnet (3) using a 2-1/4 inch wrench fcr 3/4-inch NPT tabs.



5-7. REPAIR PROCEDURES (CONT'D)

e. Mixing Valve Assembly (Cont'd)

3. Lift strainer screen (4) out of housing (5).

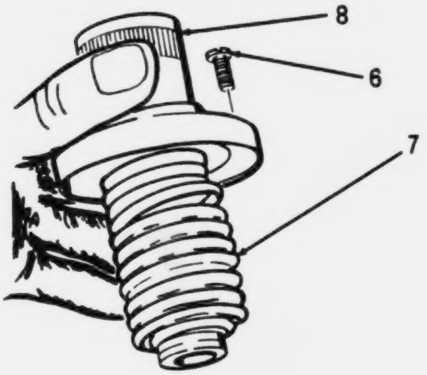


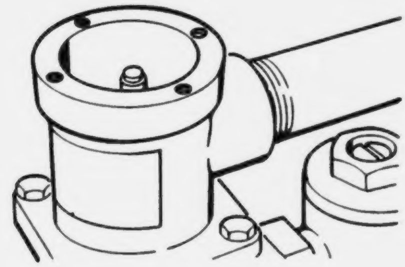
5-7. REPAIR PROCEDURES (CONT'D)

e. Mixing Valve Assembly (Cont'd)

4. Remove motor housing four capscrews (6).

5. Remove thermostatic motor (7) by lifting up temperature adjustment knob (8).

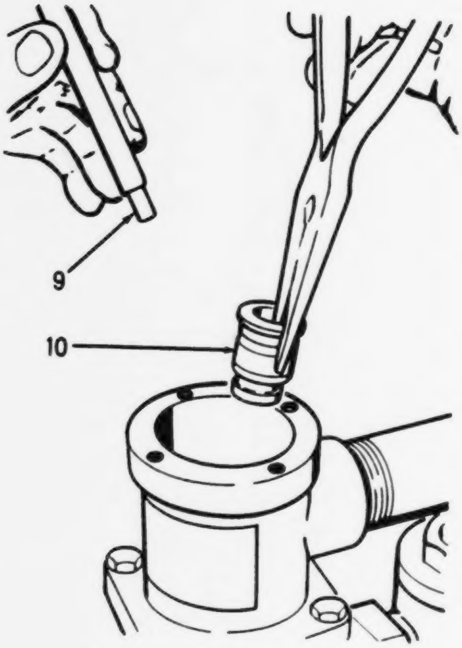




5-7. REPAIR PROCEDURES (CONT'D)

e. Mixing Valve Assembly (Cont'd)

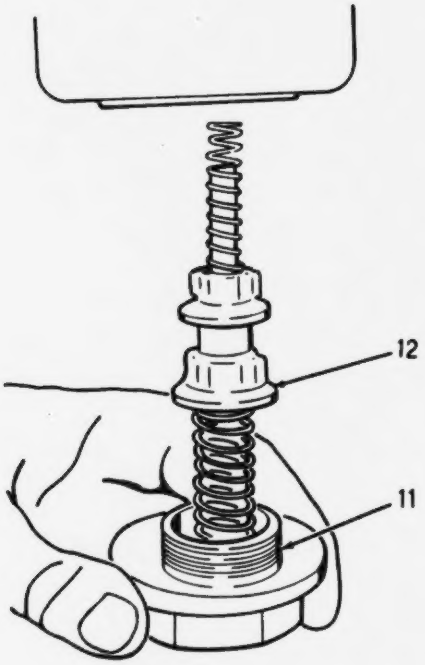
6. Lift out overload assembly (9) and hot water poppet (10).



5-7. REPAIR PROCEDURES (CONT'D)

e. Mixing Valve Assembly (Cont'd)

7. Remove body cap (11) using wrench to service cold water poppet assembly (12).



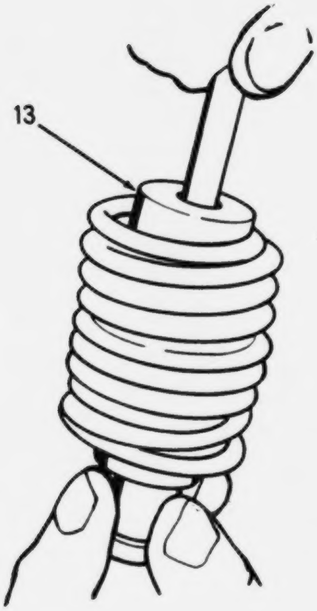
5-7. REPAIR PROCEDURES (CONT'D)

e. Mixing Valve Assembly (Cont'd)

8. Carefully insert ruler or pencil into motor bellows (13) and measure insertion depth. If depth is greater than 1 3/4 inches (44mm), replace motor.

NOTE

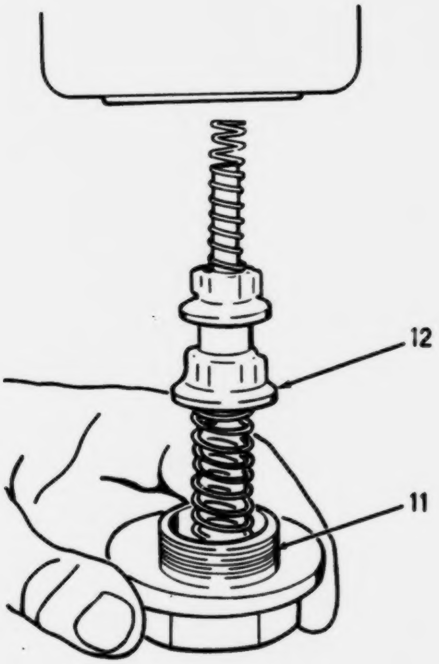
Motor bellows should offer firm resistance to rigid object inserted inside bellows.



5-7. REPAIR PROCEDURES (CONT'D)

e. Mixing Valve Assembly (Cont'd)

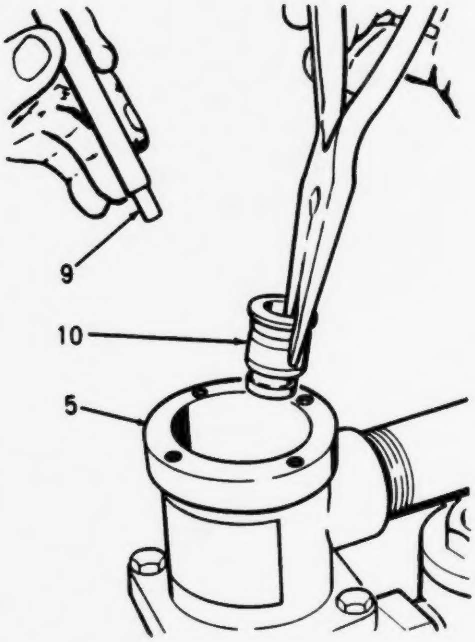
9. Install cold water poppet assembly (12) into body cap (11) and tighten poppet (12) with wrench.



5-7. REPAIR PROCEDURES (CONT'D)

e. Mixing Valve Assembly (Cont'd)

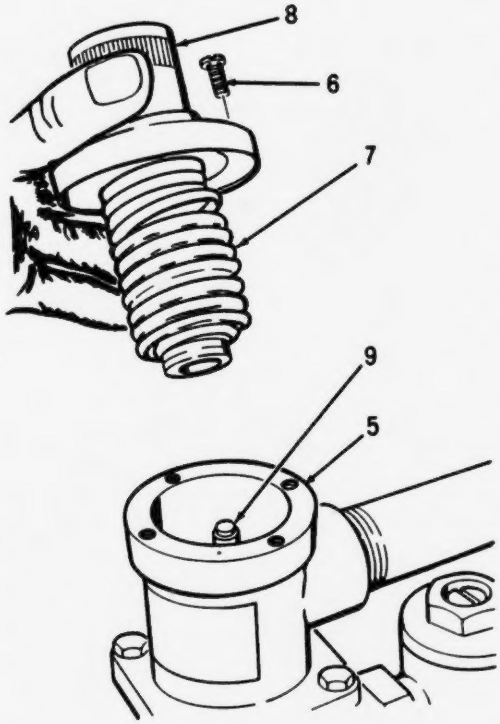
10. Install hot water poppet (10) into housing (5). Install overload assembly (9) stem into place.



5-7. REPAIR PROCEDURES (CONT'D)

e. Mixing Valve Assembly (Cont'd)

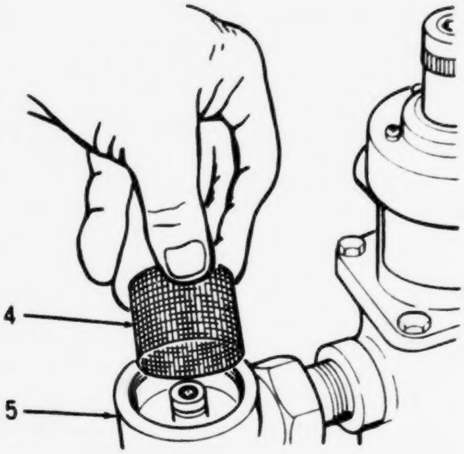
11. Install thermostatic motor (7) on overload assembly (9) by holding temperature adjustment knob (8). Secure to housing (5) with four screws (6).



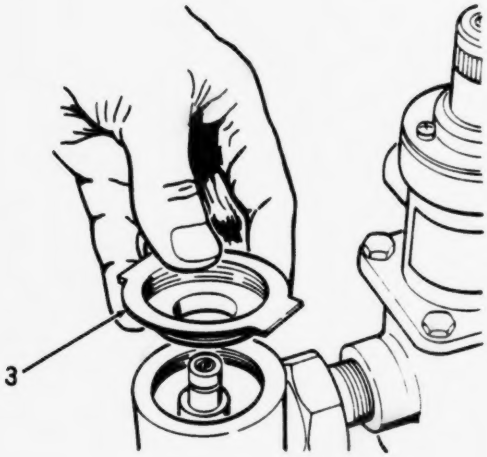
5-7. REPAIR PROCEDURES (CONT'D)

e. Mixing Valve Assembly (Cont'd)

12. Install strainer screen (4) into housing (5).



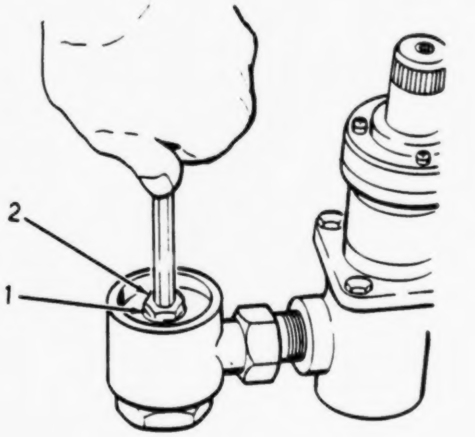
13. Install bonnet (3) using a 2-1/4 (57mm) wrench for 3/4-inch NPT tabs.



5-7. REPAIR PROCEDURES (CONT'D)

e. Mixing Valve Assembly (Cont'd)

14. Open both inlet checkstop valves (1) by turning stop valve stem (2) counterclockwise with a 1/4-inch hex key.

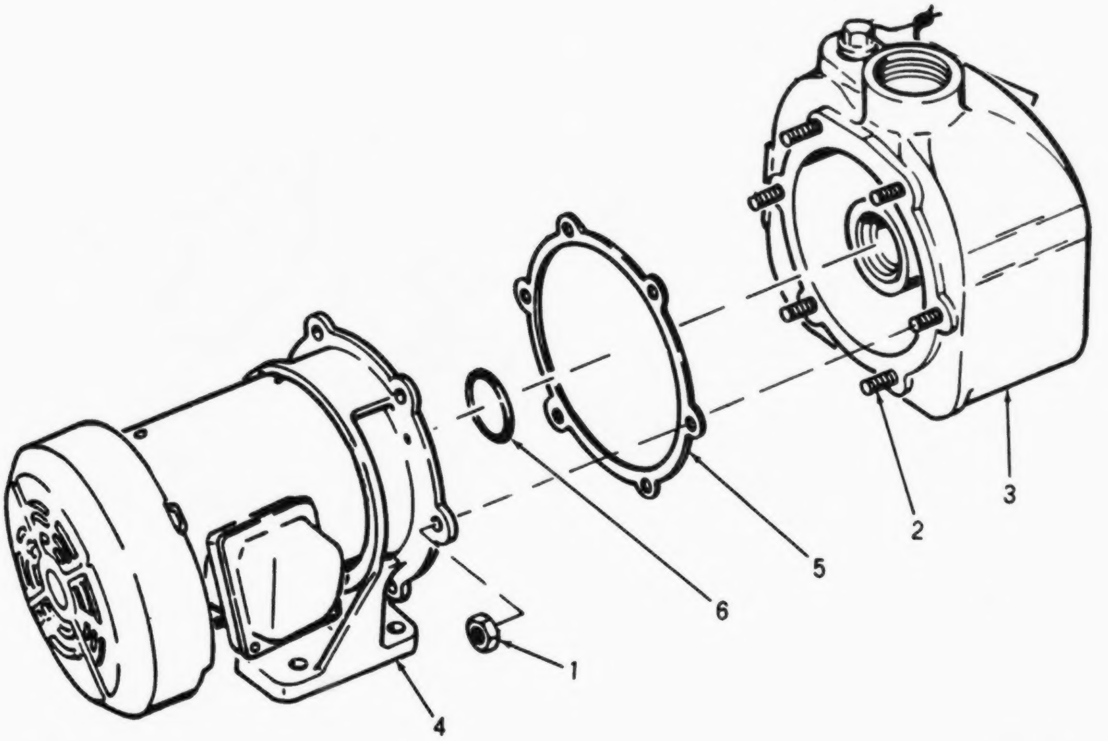


5-7. REPAIR PROCEDURES (CONT'D)

f. Water Pump. The water pump motor is an integral part of the water pump. The two are assembled in a way that requires the disassembly of the water pump to separate the motor from the pump. Failure of the water pump may be due to worn casing or bracket or bad seals and gaskets. Disassemble the water pump and inspect for worn or damaged parts and replace if necessary. Gaskets and seals are supplied in a kit. Use all parts in the kit to replace old parts.

1. Remove six hex nuts (1) from studs (2) attaching volute casing (3) to intermediate bracket (4). Separate volute casing (3) from intermediate bracket (4).

2. Remove volute gasket (5) and vane plate O-ring (6).



5-7. REPAIR PROCEDURES (CONT'D)

f. Water Pump (Cont'd)

3. Remove two machine screws (7) holding vane plate (8) to intermediate bracket (4). Remove vane plate.

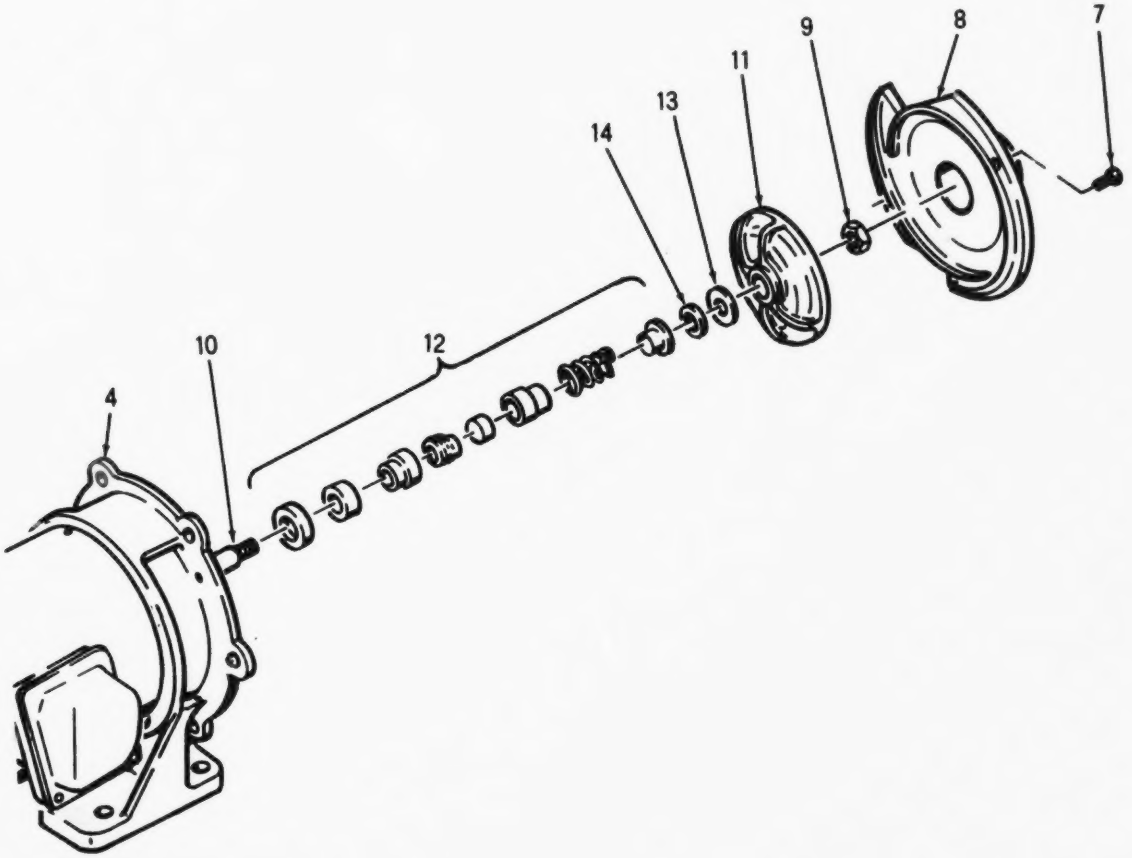
4. Unscrew and remove impeller jam nut (9) from motor shaft (10). Use block of wood to hold impeller in place while removing nut.

5. Unscrew and remove impeller (11) from motor shaft (10).

NOTE

Tag and tie seal assembly (12) when removed.

6. Remove impeller shim set (13), seal washer (14), and seal assembly (12) from motor shaft (10).

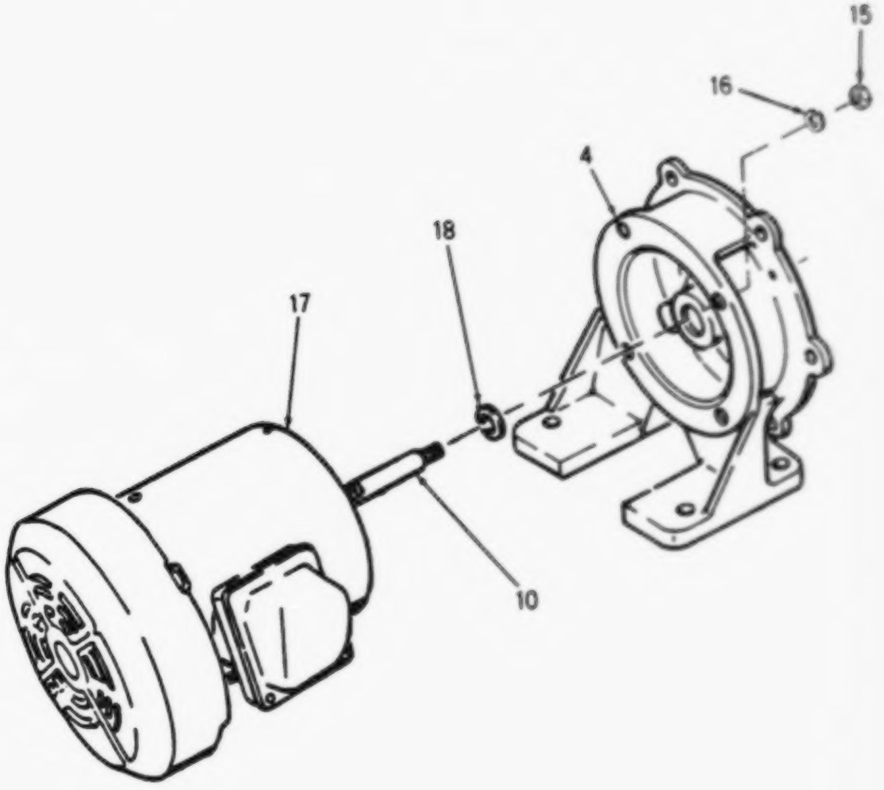


5-7. REPAIR PROCEDURES (CONT'D)

f. Water Pump (Cont'd)

7. Remove four nuts (15) and four washers (16) holding motor (17) to intermediate bracket (4). Remove motor.

8. Slip slinger ring (18) from motor shaft.

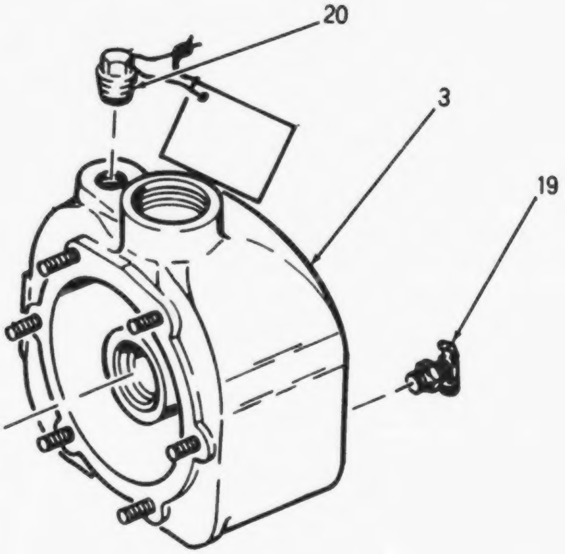


5-7. REPAIR PROCEDURES (CONT'D)

f. Water Pump (Cont'd)

9. Unscrew and remove suction port drain plug (19) from volute casing (3).

10. Unscrew and remove fill plug (20) from volute casing (3).



5-7. REPAIR PROCEDURES (CONT'D)

f. Water Pump (Cont'd)

11. Inspect for broken or cracked motor housing, damaged shaft threads, and bent shaft.

12. Inspect volute casing for breaks, cracks, and damaged threads. Inspect for cracked studs and damaged stud threads.

13. Inspect for broken, cracked, badly worn or dirty impeller and vane plate.

14. Examine seal assembly mating surfaces to make sure they are highly polished, and are not pitted, scratched, or scored.

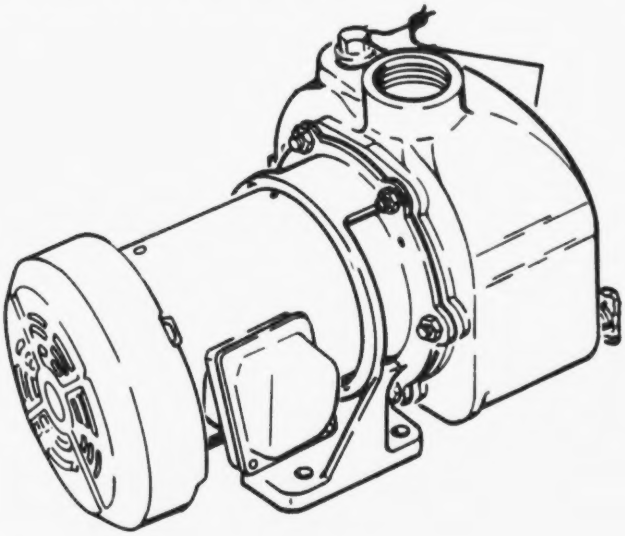
15. Inspect volute drain plug for broken handle and damaged threads. Inspect suction port drain plug and fill plug assembly for damaged threads.

16. Clean dirt and foreign matter from impeller and vane plate.

WARNING

Drycleaning solvent, P-D-680 (Safety or Stoddard Solvent) is potentially dangerous. Avoid repeated and prolonged breathing vapors and skin contact with liquid. Do not use near open flame, arcing equipment, or other ignition sources. Use in well-ventilated area.

17. Clean seal cavity and motor shaft with soft cloth soaked in cleaning solvent (4, Appendix E).

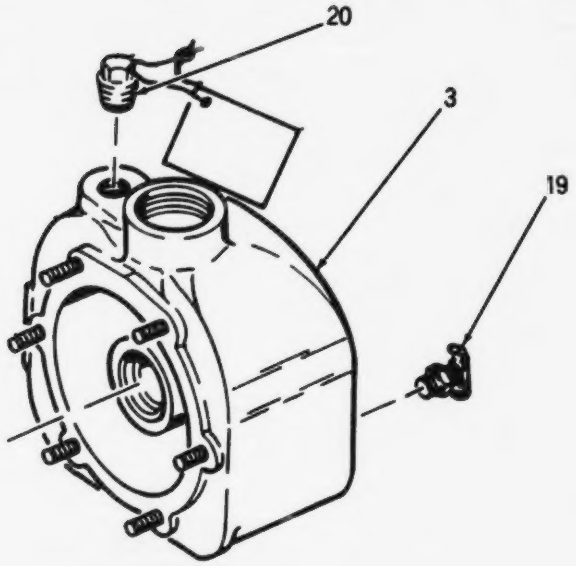


5-7. REPAIR PROCEDURES (CONT'D)

f. Water Pump (Cont'd)

18. Screw fill plug (20) into volute casing (3).

19. Screw suction port drain plug (19) into volute casing (3).

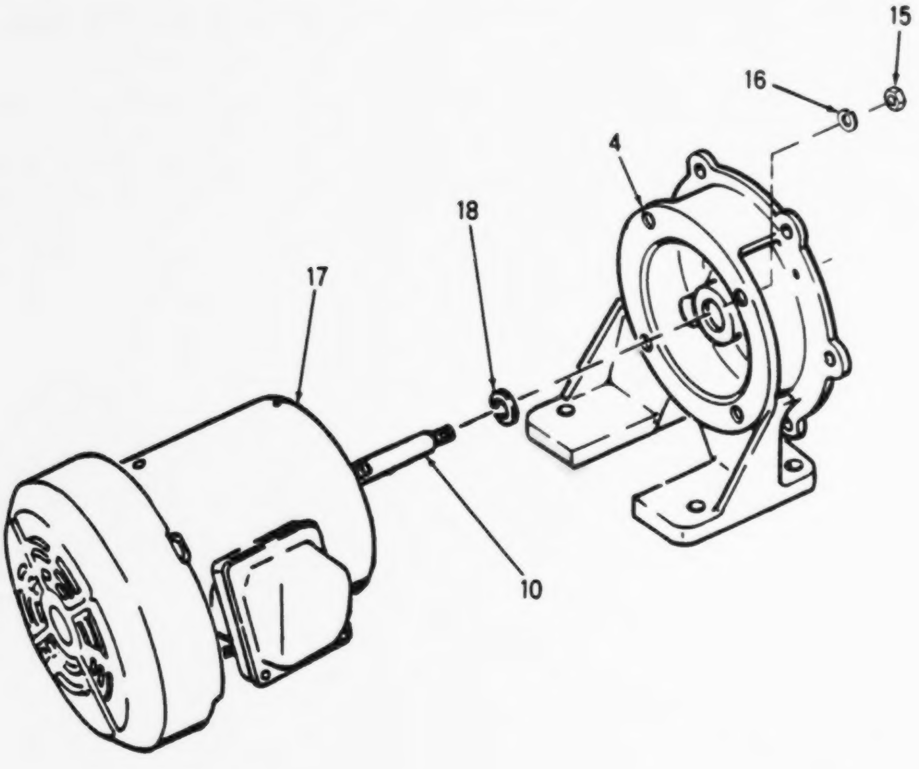


5-7. REPAIR PROCEDURES (CONT'D)

f. Water Pump (Cont'd)

20. Slide slinger ring (18) onto motor shaft (10).

21. Set motor (17) in place on intermediate bracket (4) and secure with four washers (16) and four nuts (15).



5-7. REPAIR PROCEDURES (CONT'D)

f. Water Pump (Cont'd)

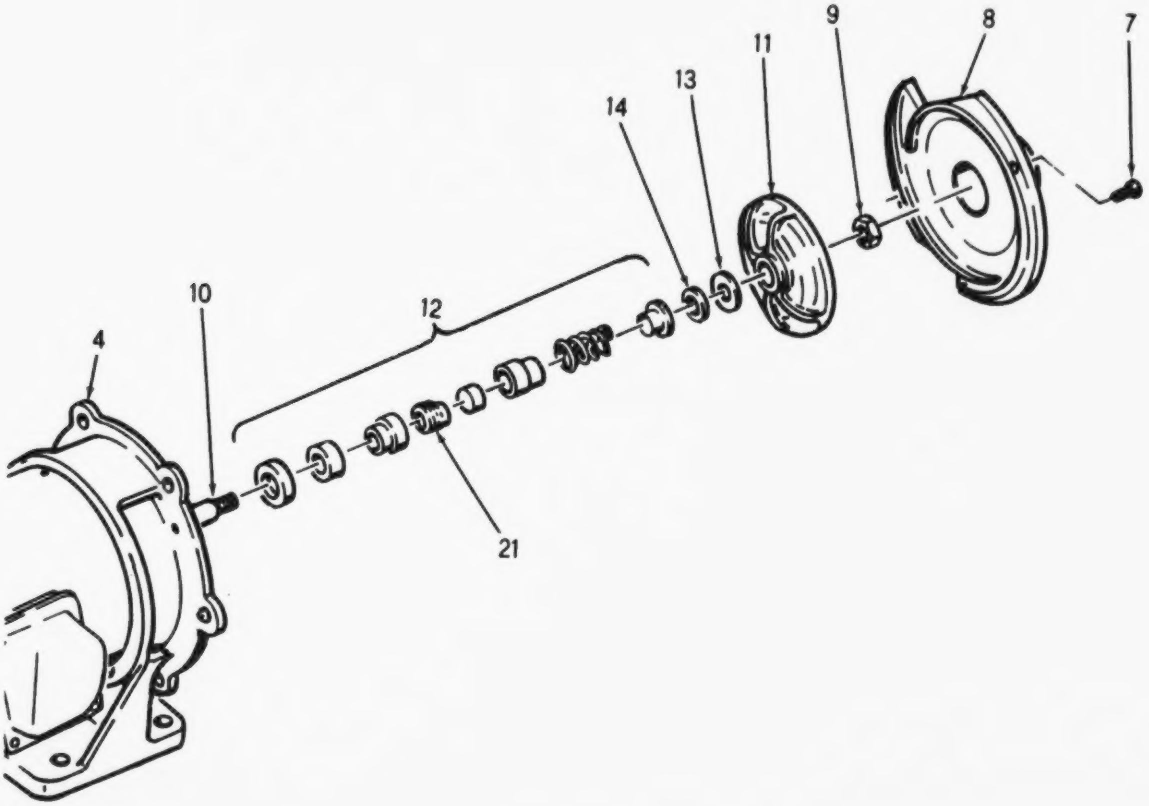
22. Lubricate bellows (21) of seal assembly (12) with soft grease (15, Appendix E) and place a drop of light lubricating oil (3, Appendix E) on lapped faces of seal assembly. Install seal assembly on water pump motor shaft (10).

NOTE

Adjust impeller (11) by installing or removing impeller shims on motor shaft.

23. Slip seal washer (14) then impeller shim set (13) onto water pump motor shaft (10).

24. Screw impeller (11) onto water pump shaft (10) and place vane plate (8) over impeller. If impeller does not bind against vane plate, remove impeller and vane plate and add shims until impeller does bind against vane plate. Remove 0.10-inch of shims.



5-7. REPAIR PROCEDURES (CONT'D)

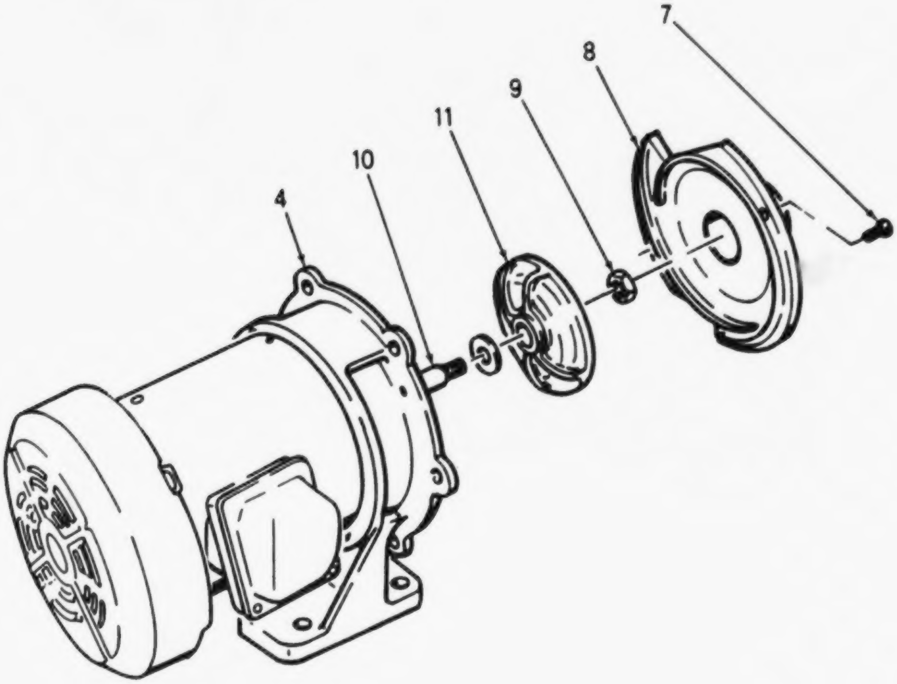
f. Water Pump (Cont'd)

25. Screw impeller (11) onto water pump shaft (10).

26. Place adhesive (12, Appendix E) on threads of impeller jam nut (9) and screw jam nut onto motor shaft.

27. Tighten impeller jam nut (9) by placing a block of wood between vanes to immobilize impeller (11).

28. Use sealant (13, Appendix E) on vane plate (8) and install vane plate to intermediate bracket (4) using two screws (7).

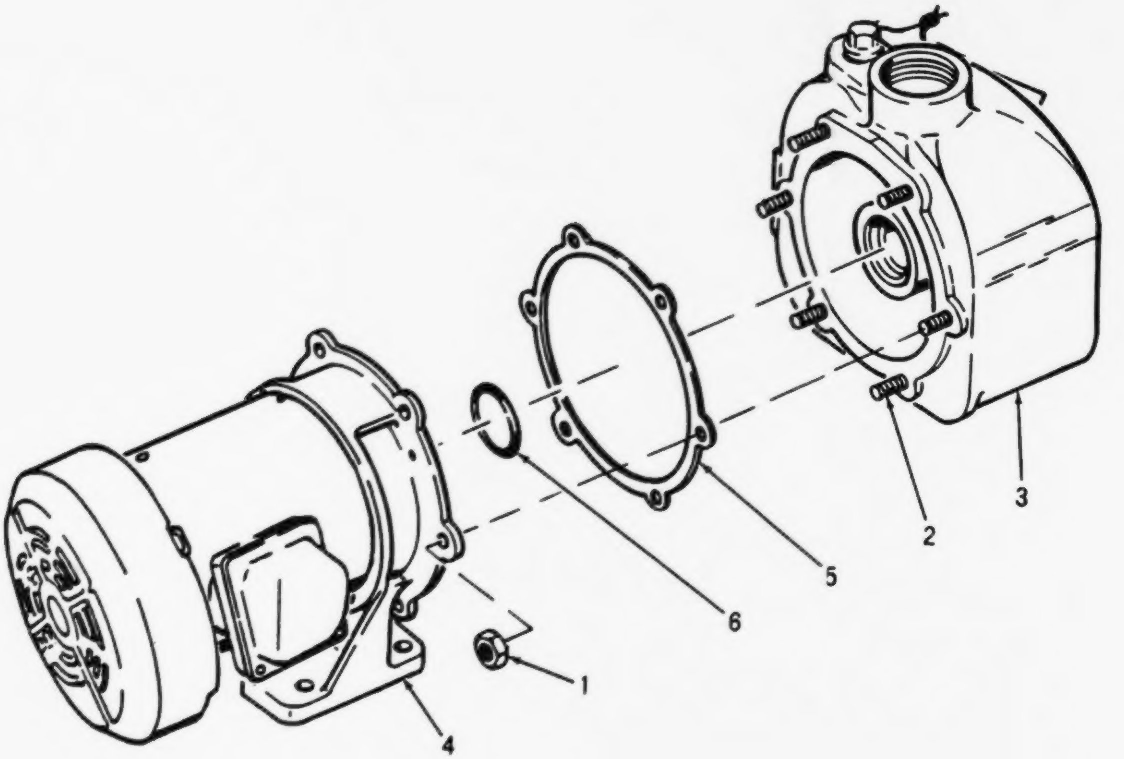


5-6. REPAIR PROCEDURES (CONT'D)

f. Water Pump (Cont'd)

29. Use new volute gasket (5) and O-ring (6) and install on volute casing (3).

30. Install volute casing (3) onto intermediate bracket (4) using six nuts (1).



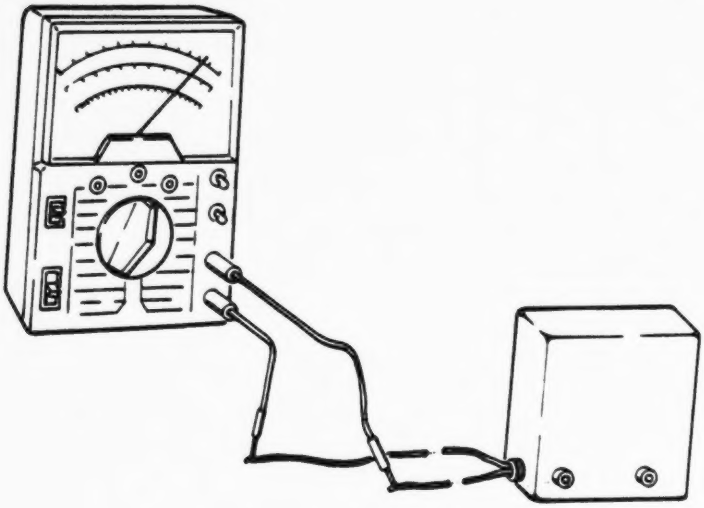
5-7. REPAIR PROCEDURES (CONT'D)

g. Ignition Transformer. These procedures test the ignition transformer. If the transformer fails the test, replace the transformer.

1. Disconnect ignition transformer primary wires at water heater control box and disconnect ignition wires at transformer.

2. Check resistance between two wires. Resistance should be approximately 7 ohms. A reading of 0 or infinity shows a defective transformer.

3. Check resistance between one wire and transformer case. Resistance should be infinity (open circuit). A short (0 ohms) shows a defective transformer.

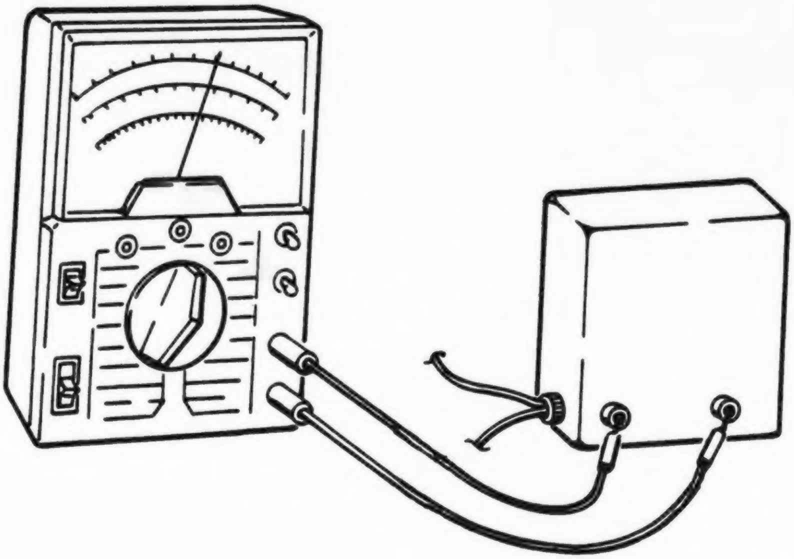


5-7. REPAIR PROCEDURES (CONT'D)

g. Ignition Transformer (Cont'd)

4. Check resistance between output connectors. Resistance should be approximately 20 kilohms. A reading of 0 or infinity shows a defective transformer.

5. Check resistance between each output connector and transformer case. Resistance should be approximately 10 kilohms. A short or infinite resistance indication shows a defective transformer.

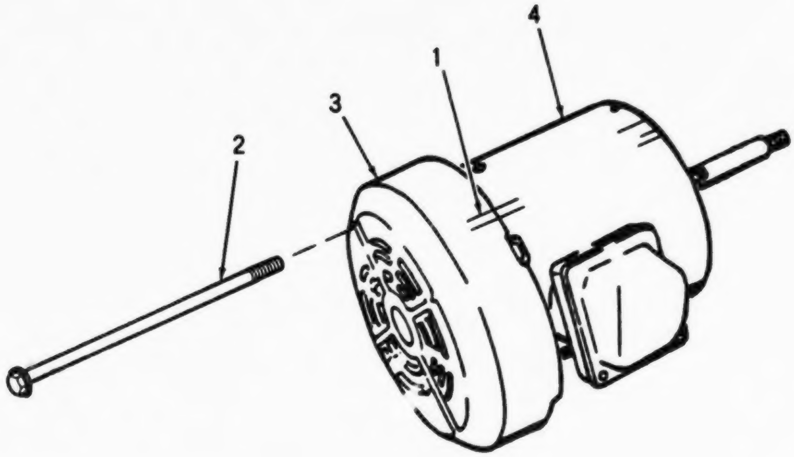


5-7. REPAIR PROCEDURES (CONT'D)

h. Electrical Motor. Repair instructions for the water pump motor and blower assembly motor are the same. Use these instructions for the repair of each motor. Use separate parts list for replacement parts. The water pump motor is an integral part of the water pump. The motor can only be removed during disassembly of the water pump. Refer to paragraph 5.6.f for water pump motor removal and paragraph 4-141 for blower motor removal.

1. Place mark (1) on motor housing and end plates for ease in reassembly.

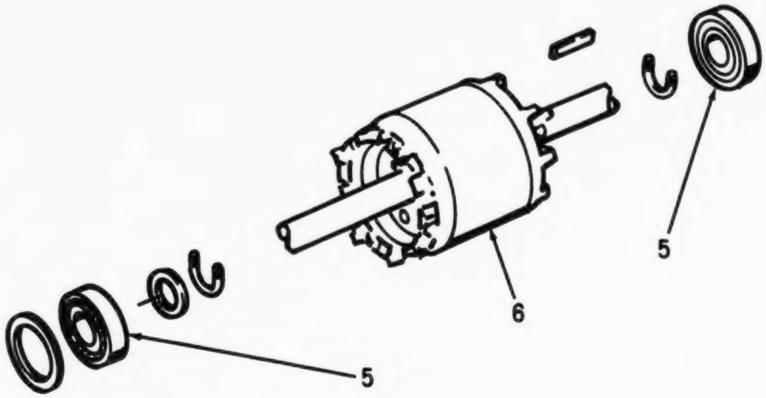
2. Remove four bolts (2) holding end plates (3) to housing (4).



5-7. REPAIR PROCEDURES (CONT'D)

h. Electrical Motor (Cont'd)

3. Remove bearings (5) from rotor (6). Clean all parts with a clean dry cloth except bearings. Clean bearings with a clean, lint-free cloth moistened in light engine oil.

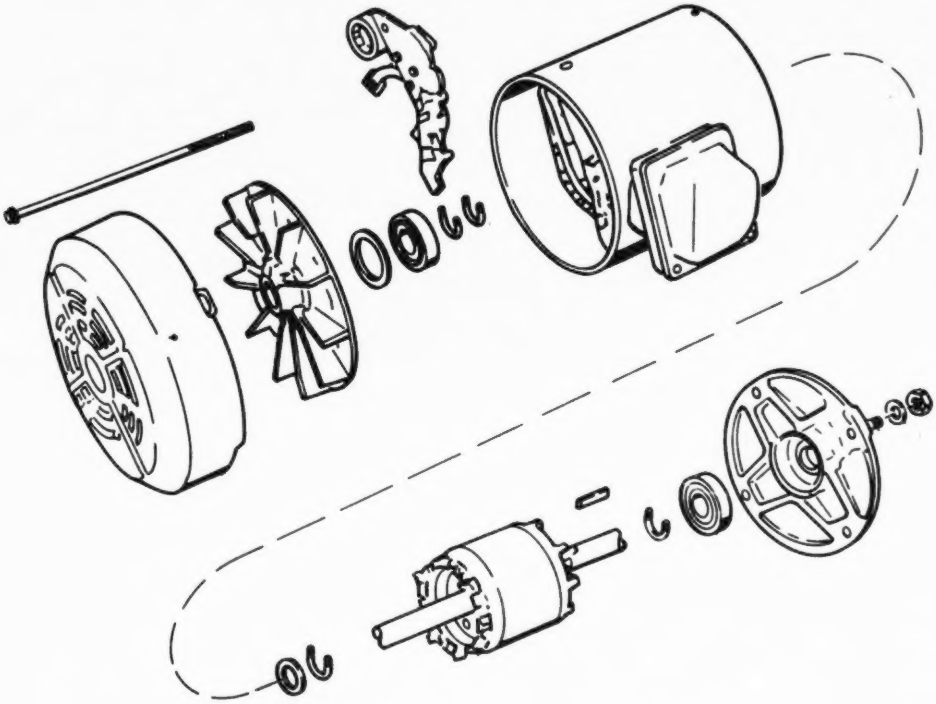


5-7. REPAIR PROCEDURES (CONT'D)

g. Electrical Motor (Cont'd)

h. Inspect for broken or cracked motor and bent shaft, burned rotor, bent fins, mounting plate, and damaged wiring. If any of these items are damaged, replace motor.

5. If bearings are rough or excessively worn, replace bearings.

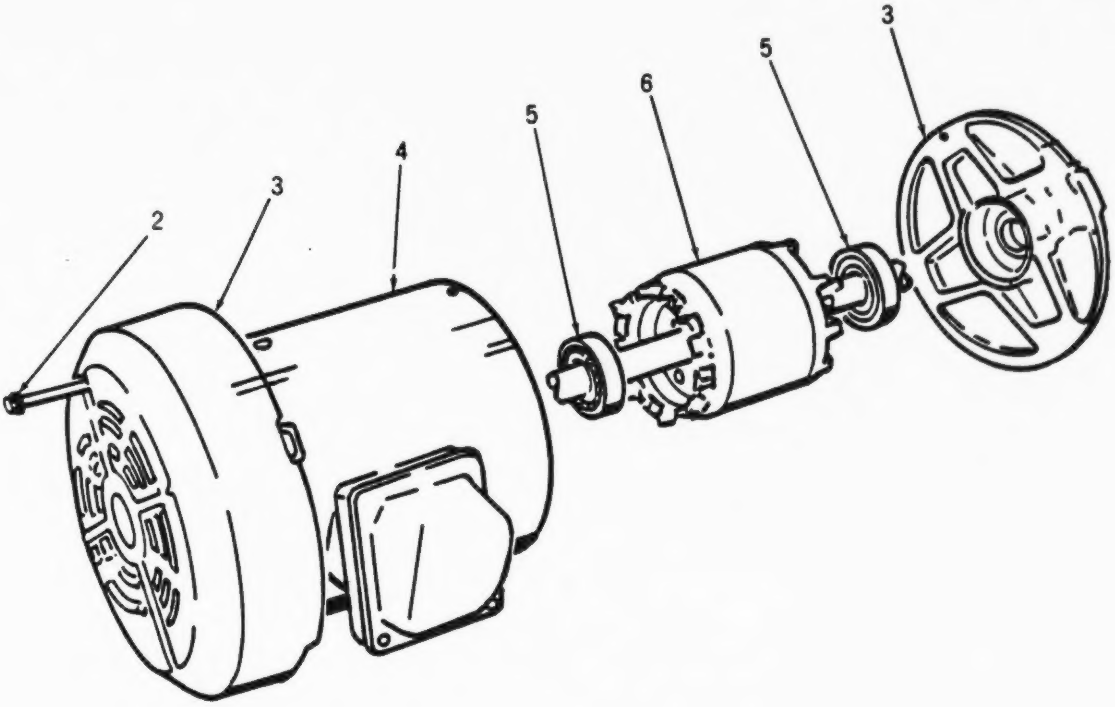


5-7. REPAIR PROCEDURES (CONT'D)

h. Electrical Motor (Cont'd)

6. Install bearings (5) onto rotor (6). Install end plates (3) into housing (4) in alignment with markings on housing.

7. Secure using four bolts (2).



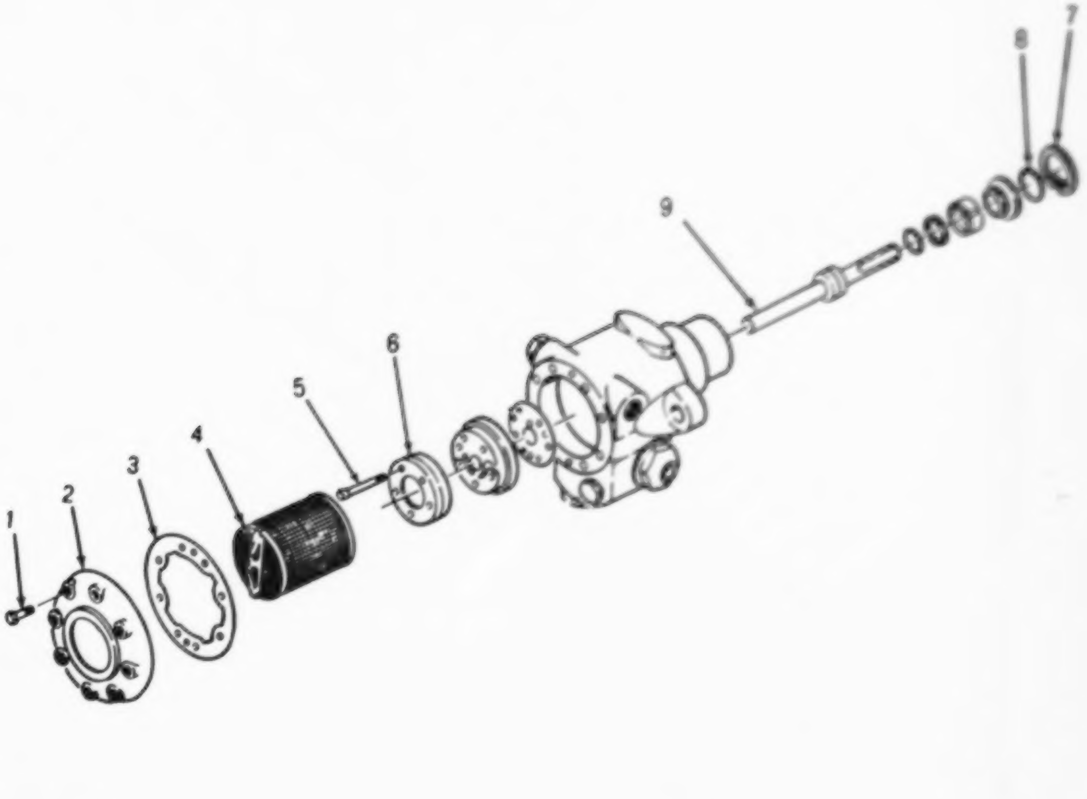
5-7. REPAIR PROCEDURES (CONT'D)

i. Blower Assembly. The blower assembly comprises a blower motor, fuel pump, fuel filter, and air shutter assembly. These items were removed by organizational maintenance for repair. The following paragraphs describe the repair of the blower assembly subassemblies.

j. Blower Motor. The blower motor and water pump motor repair instructions are the same. Refer to paragraph 5-6g.

k. Fuel Pump. A fuel pump failure may be caused by a clogged filter, worn, or broken parts. Repair of the fuel pump consists of complete disassembly, cleaning of parts, inspection, and replacement of kit items as well as other parts that may be defective. Proceed as follows.

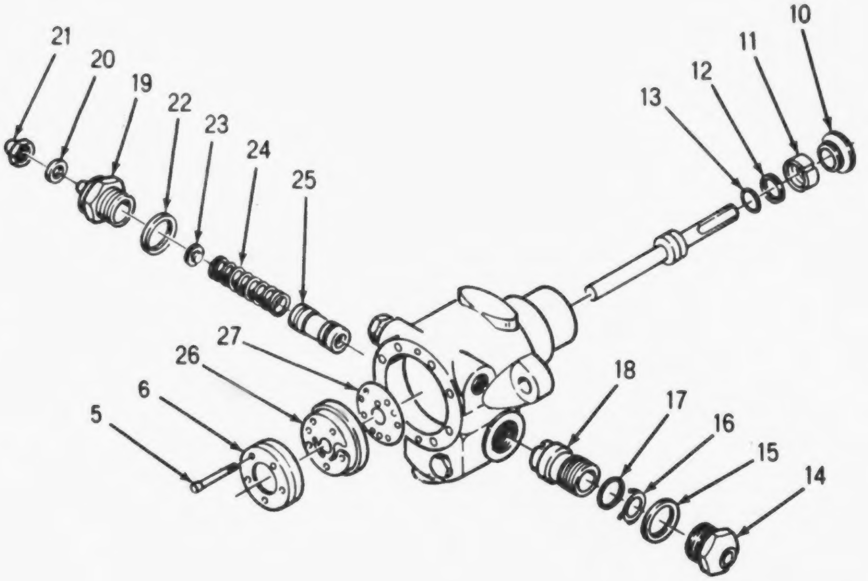
1. Remove eight screws (1) and remove cover (2) and cover gasket (3) from fuel pump body.
2. Grasp strainer (4) by handle and pull strainer out.
3. Unscrew five gearset screws (5) and remove end plate assembly (6).
4. Use snapring pliers to remove retaining ring (7) and O-ring (8) and press shaft assembly (9) out of body.



5-7. REPAIR PROCEDURES (CONT'D)

k. Fuel Pump (Cont'd)

5. Remove stationary face seal (10), seal (11), washer (12) and O-ring (13).
6. Remove nozzle plug assembly (14) and gasket (15).
7. Remove sleeve retaining spring (16), O-ring (17), and piston sleeve (18).
8. Remove end plug assembly (19, 20, 21) and gasket (22).
9. Remove spring seat (23), piston spring (24), and piston assembly (25).
10. Press port housing (26) from body and remove port housing gasket (27).



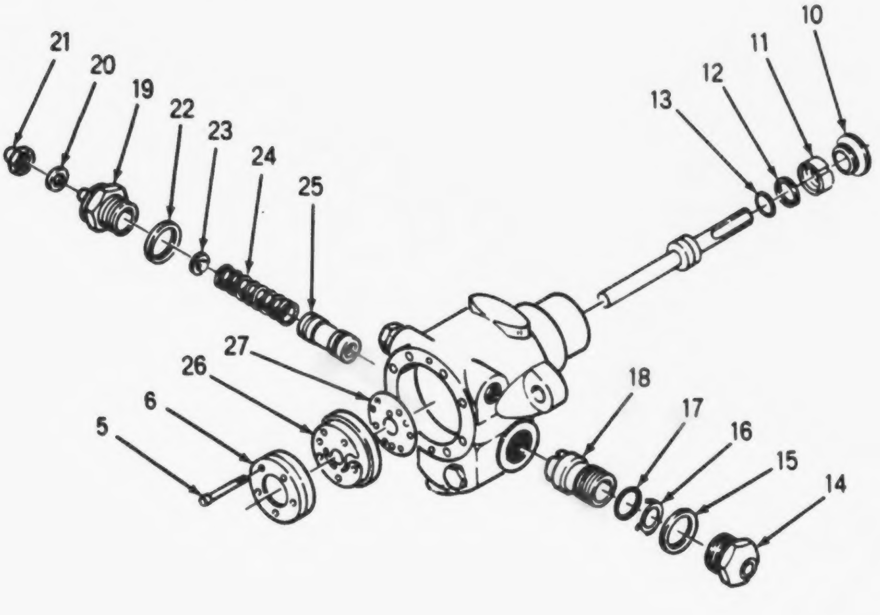
5-7. REPAIR PROCEDURES (CONT'D)

k. Fuel Pump (Cont'd)

WARNING

Drycleaning solvent, P-D-680 (4, Appendix E) is potentially dangerous. Avoid repeated and prolonged breathing of vapors and skin contact with liquid. Do not use near open flame, arcing equipment, or other ignition sources. Use in well-ventilated area.

11. Clean all parts in solvent (4, Appendix E).
12. Inspect for burred, nicked, broken, scratched, and excessively worn parts. Replace defective parts and kit replacement parts.
13. Install port housing gasket (27) and port housing (26) by pressing in place.
14. Insert piston sleeve (18), O-ring (17), sleeve retaining spring (16), gasket (15) and nozzle plug assembly (14).
15. Install piston assembly (25), piston spring (24), spring seat (23), gasket (22), and end plug assembly (19, 20, 21).



5-7. REPAIR PROCEDURES (CONT'D)

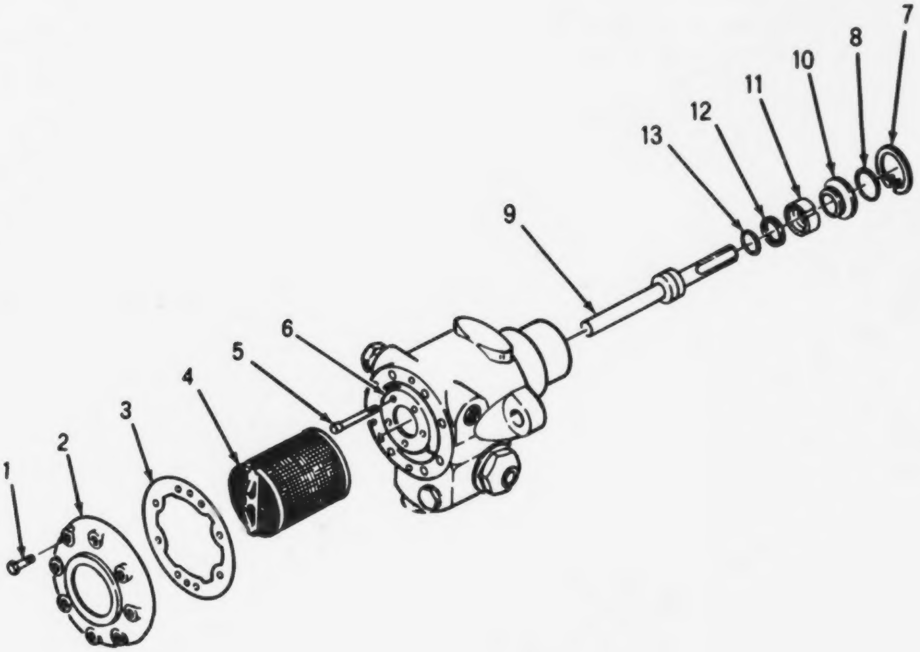
k. Fuel Pump (Cont'd)

16. Install O-ring (13), washer (12), seal (11), and stationary face seal (10).

17. Press shaft assembly (9) into body and install O-ring (8) and retaining ring (7).

18. Install end plate (6) and secure with five screws (5).

19. Push strainer (4) and assemble gasket (3) and cover (2) and secure to pump body with eight screws (1).



5-7. REPAIR PROCEDURES (CONT'D)

l. Welded Boiler Tank and Skid. The welded boiler tank may become damaged in shipment. Minor dents and scratches can be repaired by coating the affected area with paint. A ruptured tank or broken leg can be repaired by welding. More severe damage may require the complete replacement of the tank. If making minor repairs, remove only those assemblies or parts necessary to gain access to the damaged areas.

1. Remove smokestack assembly (paragraph 4-10d).
2. Remove fuel supply control assembly (paragraph 4-14a).
3. Remove burner head assembly (paragraph 4-14b).
4. Remove ignition transformer (paragraph 4-14c).
5. Remove conduit, electrical fittings and wiring (paragraph 4-14.d).
6. Remove temperature high limit and operation limit controls (paragraph 5-6l).
7. Remove manifold connections and fittings (paragraph 4-14.f).
8. Remove instructional, identification and warning plates (paragraph 4-14g).
9. Remove ignition cables (paragraph 4-14h).
10. Remove blower assembly (paragraph 4-14i).
11. Remove UV scanner (paragraph 5-6i).
12. Remove low water probe assembly (paragraph 5-6l).
13. Remove master control box assembly (paragraph 5-6m).

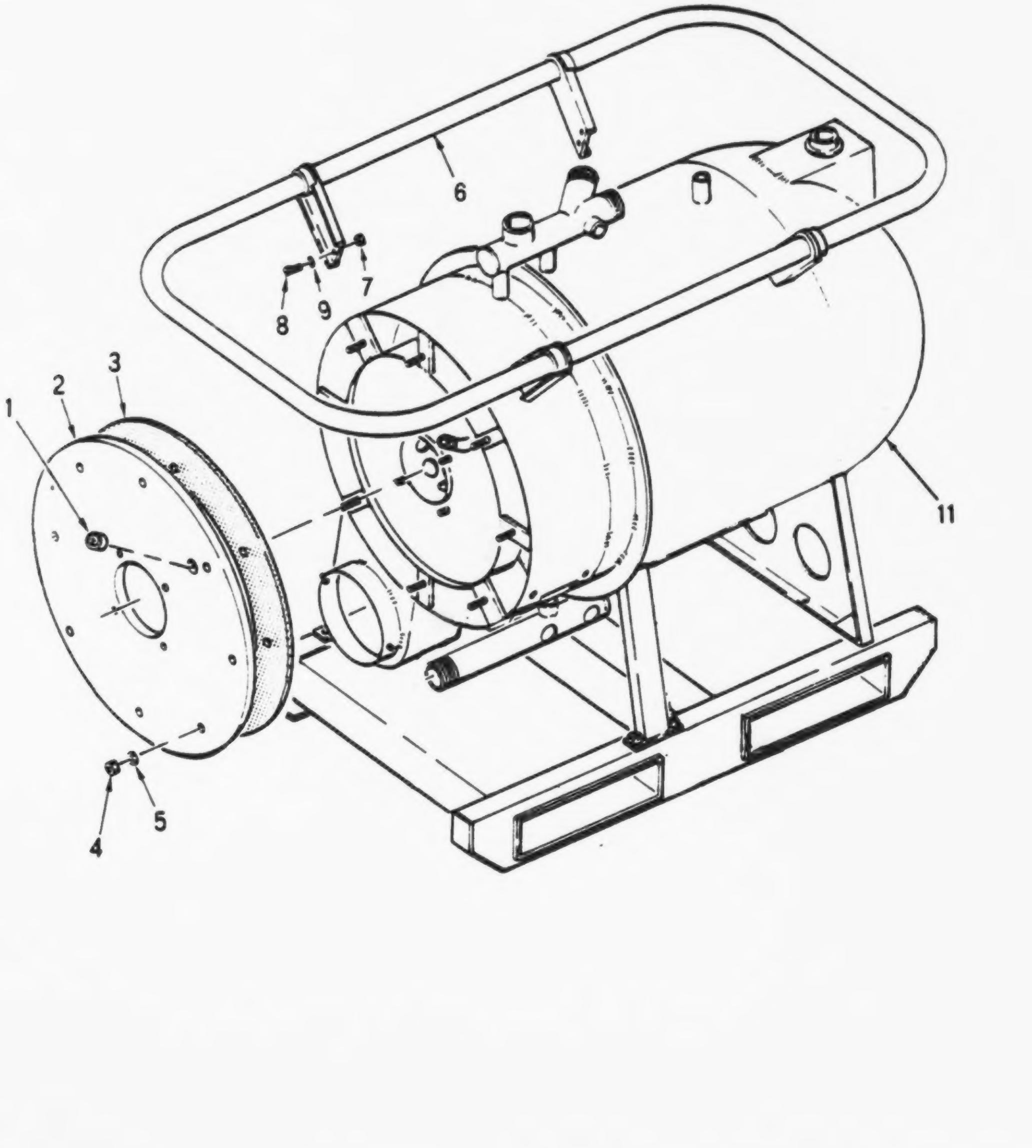
5-7. REPAIR PROCEDURES (CONT'D)

1. Welded Boiler Tank and Skid (Cont'd)

14. Remove sight assembly cap (1) by turning counterclockwise.

15. Remove smoke box cover (2) and smoke box cover gasket (3) by removing eight nuts (4) and eight washers (5) and slide smoke box cover off.

16. Remove water heater handle (6) by removing eight nuts (7), eight screws (8), and eight washers (9) and lift handle up.



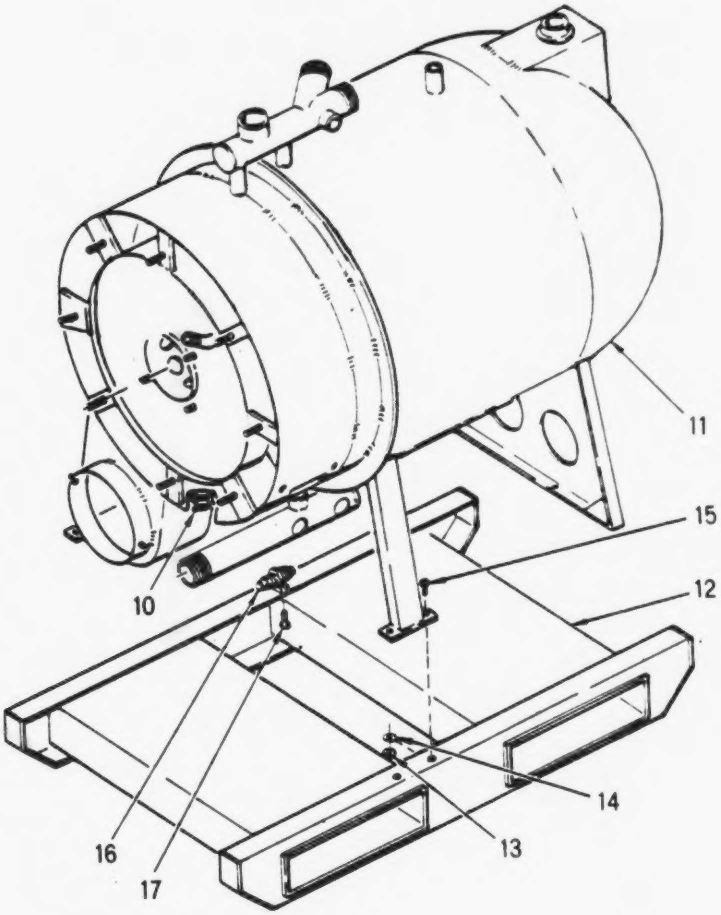
5-7. REPAIR PROCEDURES (CONT'D)

1. Welded Boiler Tank and Skid (Cont'd)

17. Remove drain cock (10) from water tank (11) by turning counterclockwise.

18. Remove skid (12) from water tank (11) by removing eight nuts (13), eight washers (14) and eight screws (15).

19. Remove fuel line holder (16) by removing two screws (17).



5-7. REPAIR PROCEDURES (CONT'D)

1. Welded Boiler Tank and Skid (Cont'd)

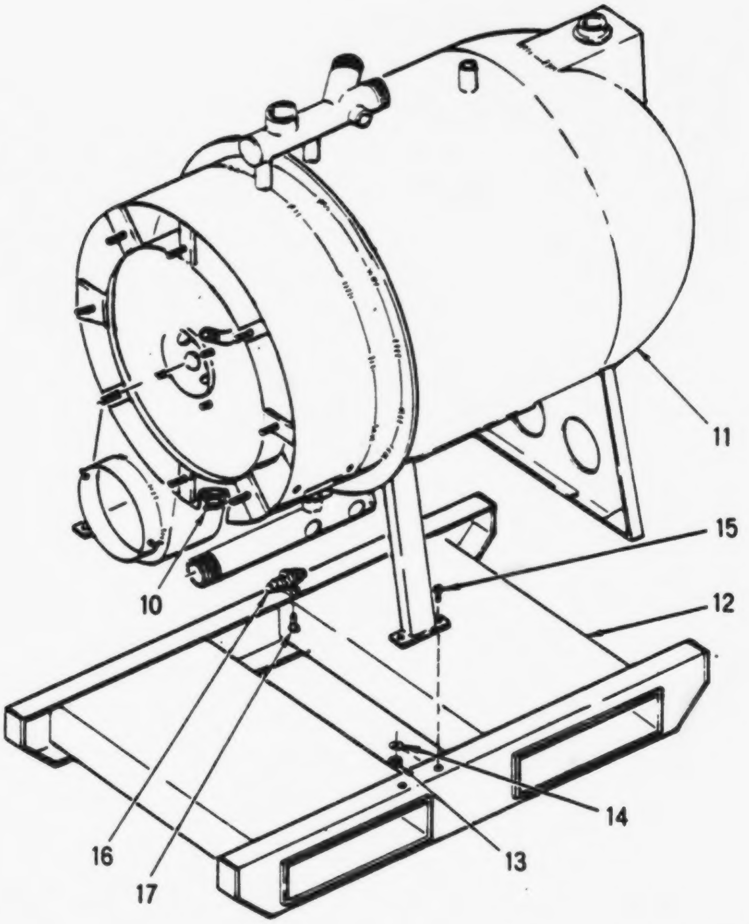
20. Make needed repairs to tank or skid or replace tank or skid as necessary (see Chapter 6, paragraphs 6-4 and 6-5).

21. Apply primer coat and finish coat of paint to exposed areas as per paragraph 4-14.n.

22. Install fuel line holder (16) and secure with two screws (17).

23. Attach skid (12) to water tank (11) using eight screws (15), eight washers (14) and eight nuts (13).

24. Install drain cock (10) by inserting in water tank (11) and turning clockwise.



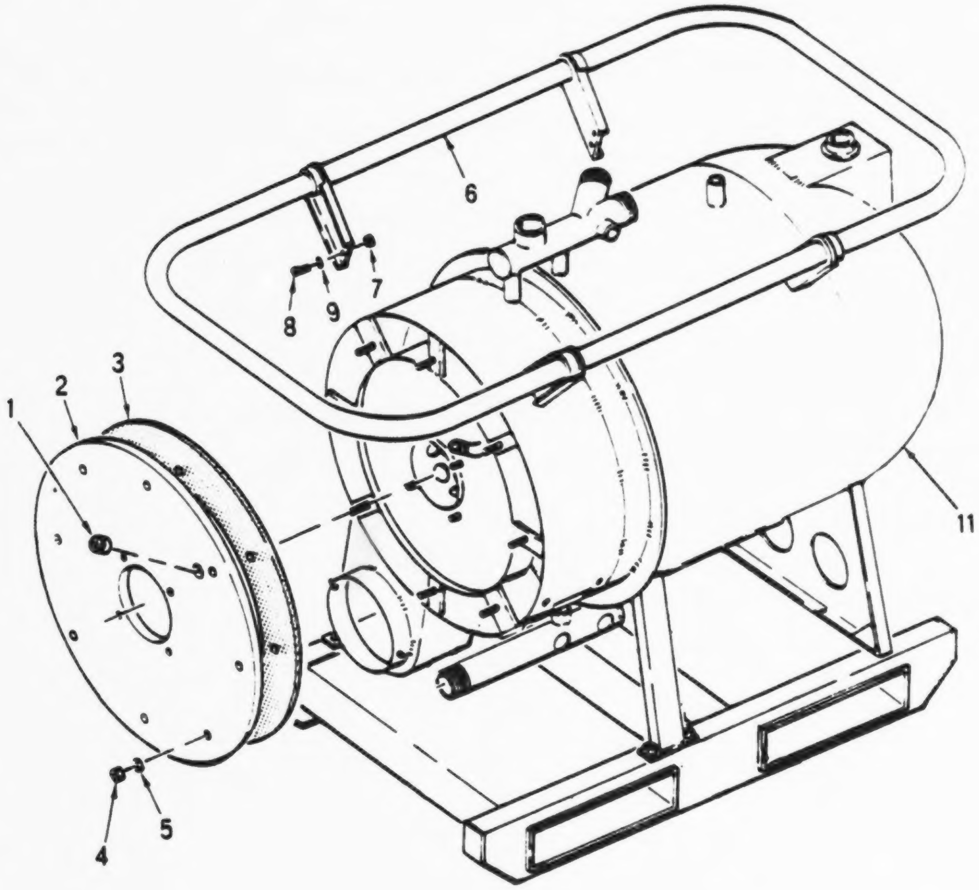
5-7. REPAIR PROCEDURES (CONT'D)

1. Welded Boiler Tank and Skid (Cont'd)

25. Install water heater handle (6) on water tank (11) and secure with eight screws (8), eight washers (9), and eight nuts (7).

26. Install smoke box cover (2) and gasket (3) and secure with eight washers (5) and eight nuts (4).

27. Install sight assembly cap (1) on sight tube by turning clockwise.



5-7. REPAIR PROCEDURES (CONT'D)

1. Welded Boiler Tank and Skid (Cont'd)

28. Install master control box assembly (paragraph 5-6.m).
29. Install low water probe assembly (paragraph 5-6.l).
30. Install UV scanner (paragraph 5-6.i).
31. Install blower assembly (paragraph 4-14.i).
32. Install ignition cables (paragraph 4-14.h).
33. Install instructional, identification, and warning plates (paragraph 4-14.g).
34. Install manifold connections and fittings (paragraph 4-14.f).
35. Install temperature high limit and operating control (paragraph 5-6.k).
36. Install conduit, electrical fittings and wiring (paragraph 4-14.d).
37. Install ignition transformer (paragraph 4-14.c).
38. Install burner head assembly (paragraph 4-14.g).
39. Install fuel supply control assembly (paragraph 4-14.a).
40. Install smokestack assembly (paragraph 4-10.d).

5-7. REPAIR PROCEDURES (CONT'D)

1. Load Limit Switch. The load limit switch used on the water pump is identical to the load limit switch used on the water heater control box assembly. Use these instructions to repair both switches.

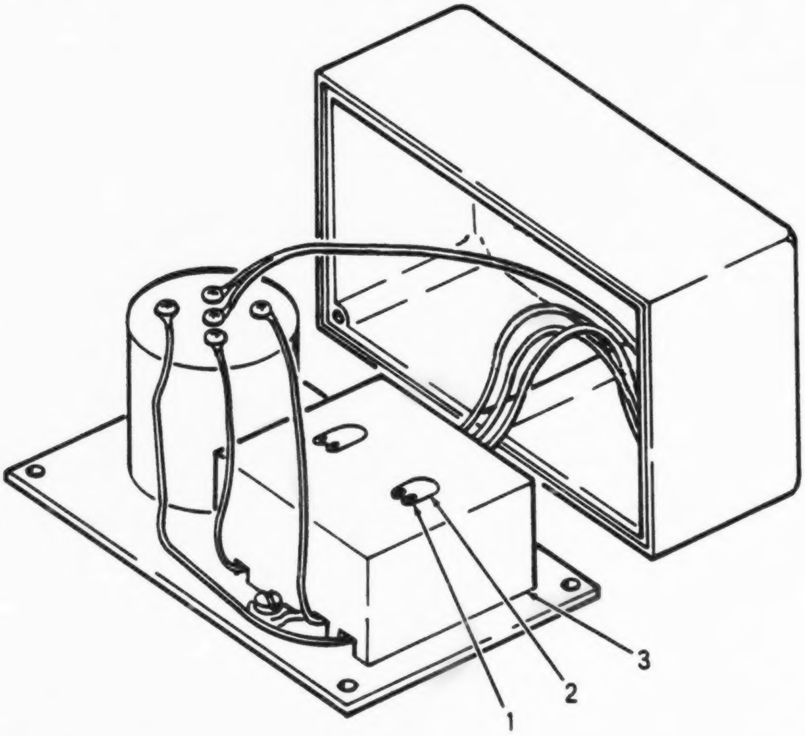
   1. Remove two screws (1) securing overload heater (2) to switch (3). Separate heater from switch.

   2. Inspect load limit switch for broken case and damaged threads. Use ohmmeter to check continuity across switch terminals with switch in ON and OFF position.

   3. Inspect overload heater for breaks or burns.

   4. Replace any defective items.

   5. Position overload heater (2) on switch (3) and secure with two screws (1).



5-7. REPAIR PROCEDURES (CONT'D)

m. UV Scanner and Flame Safeguard Control Test and Repair. The UV scanner and flame safeguard control protect operating personnel and the Bath Unit against hazards that may exist; if power fails, water temperature goes too high, water level is too low, fuel runs out or is cut off, or ignition fails. Perform the following procedures if the hot water heater fails to turn on and heat water or if it shuts down and sounds an alarm. Perform an operational check once a month if the water heater is not in use.

1. Set up Bath Unit for operation (Chapter 2).

2. Turn on fuel and power.

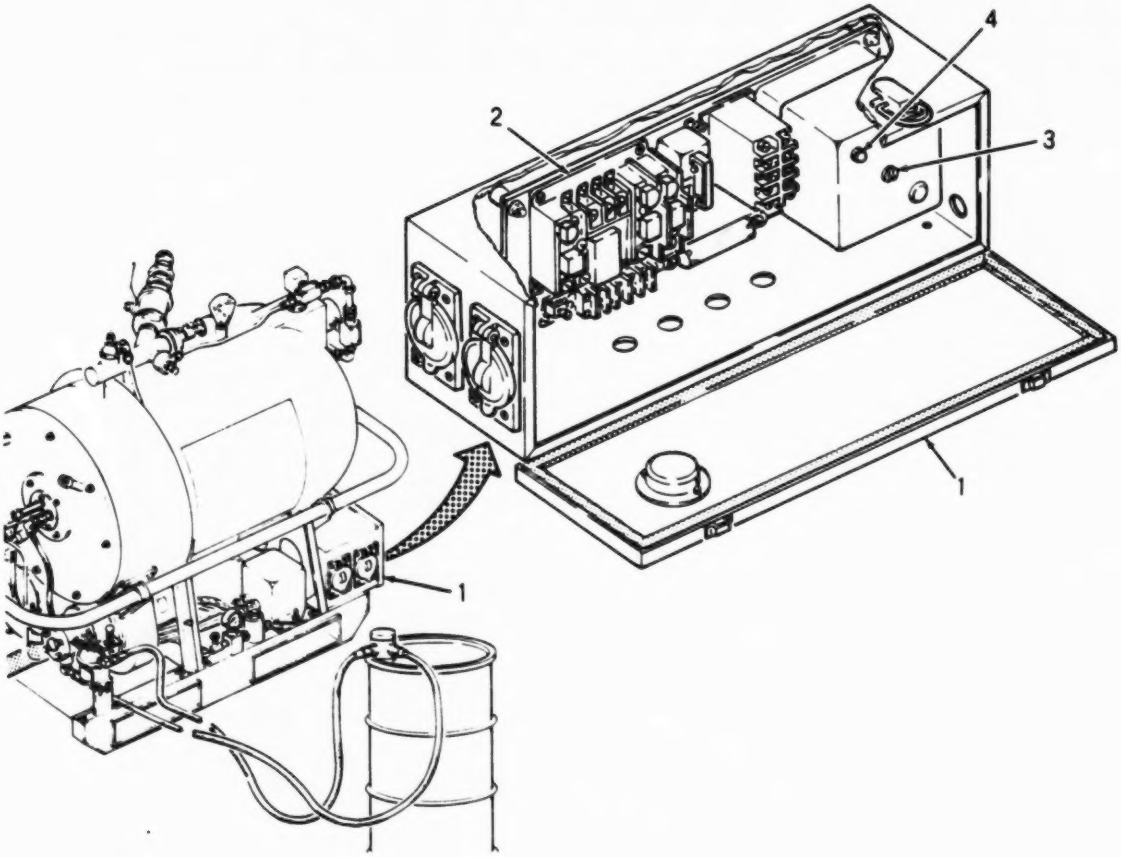
3. Wait approximately 20 seconds. If audible alarm sounds, go to step 10. If blower motor does not come on and ignition does not occur, go to next step.

5-7. REPAIR PROCEDURES (CONT'D)

m. UV Scanner and Flame Safeguard Control Test and Repair (Cont'd)

4. Open water heater control box lid (1) and check motor contactors (2). If contactors are tripped, try resetting contactors and check for normal operation. If contactors continue to trip, test motor contactor operation (paragraph 5-6.m step 7). If contactors are not tripped, go to next step.

5. Loosen screw (3) holding cover (4) on flame safeguard control. Remove cover exposing circuit card.



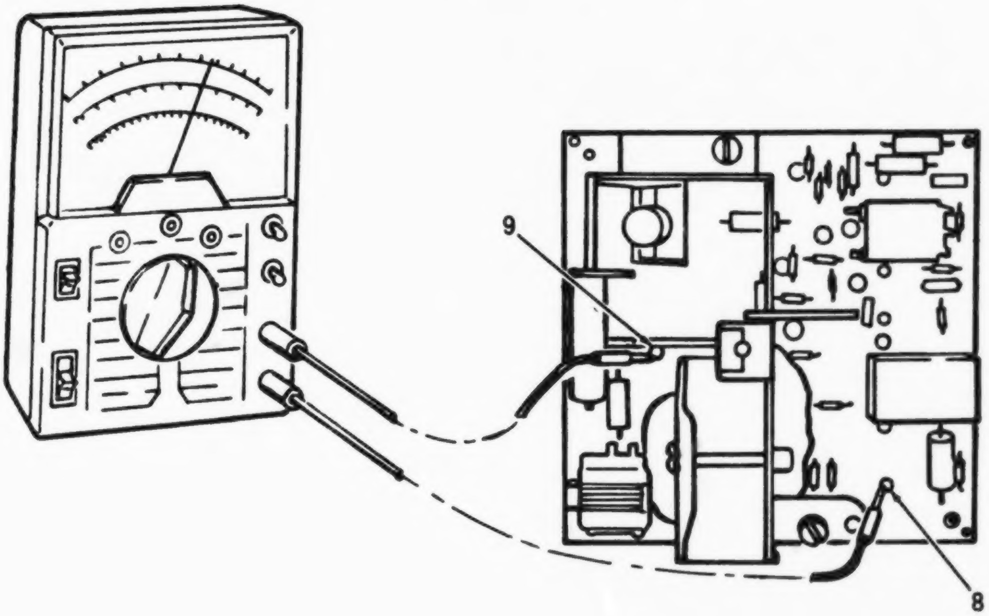
5-7. REPAIR PROCEDURES (CONT'D)

m. UV Scanner and Flame Safeguard Control Test and Repair (Cont'd)

WARNING

Voltages that are dangerous to human life are present in the control box. Exercise extreme caution when working around the control box with the lid open.

6. Using multimeter set for ac operation on 500 Vac scale, check for 120 vac at test points (9) and (8). If voltage is not normal, test power limit switch and power source (paragraph 5-6m step 6). If voltage is normal, go to next step.



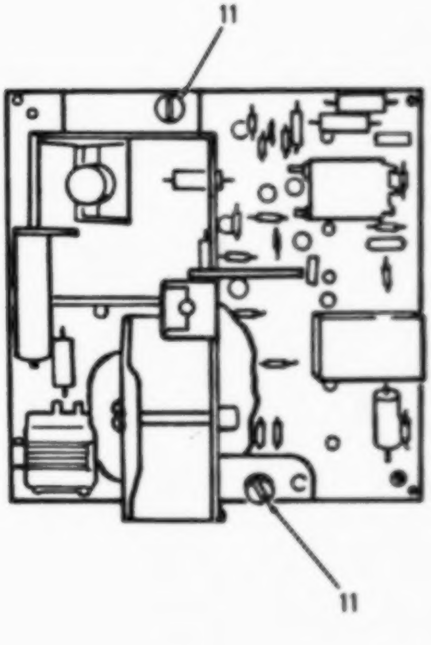
5-7. REPAIR PROCEDURES (CONT'D)

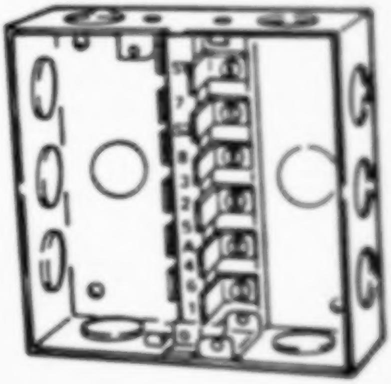
m. UV Scanner and Flame Safeguard Control Test and Repair (Cont'd)

7. Turn off power limit switch and remove flame safeguard control circuit card by removing two screws (11). Lift circuit card out.

8. Turn on power limit switch and using a multimeter check for 120 Vac on base terminal board terminals 2 and 7. If voltage is not normal, test low water probe (paragraph 5-61) and temperature limit and control circuits (paragraph 5-61). If voltage at terminals 2 and 7 is normal, go to next step and replace flame safeguard control circuit card.

9. Turn off power limit switch and install replacement flame safeguard control circuit card by setting card in place and tightening two screws (11).





5-7. REPAIR PROCEDURES (CONT'D)

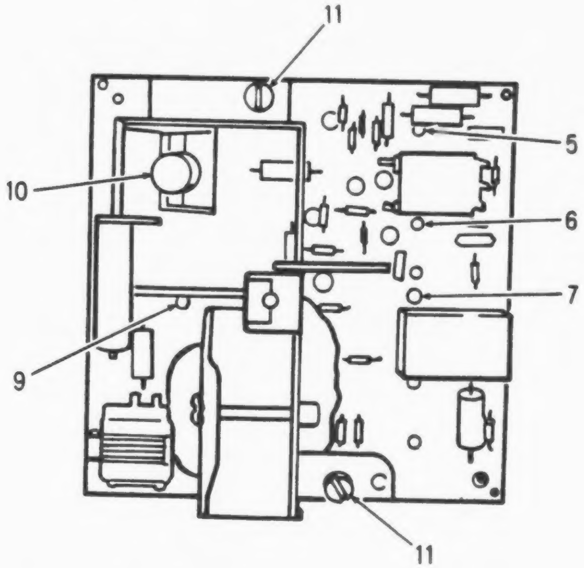
m. UV Scanner and Flame Safeguard Control Test and Repair (Cont'd)

NOTE

If the buzzer sounds, an ignition failure is indicated.

10. Organizational maintenance has determined that ignition takes place momentarily but system shuts down immediately after ignition. With multimeter set for dc operation, press reset pushbutton (10), check voltage at test points (5) and (6). If voltage is not 5 to 6 Vdc, replace UV scanner (step 12).

11. Organizational maintenance has determined that ignition does not occur after pressing reset pushbutton but buzzer sounds. With multimeter set for ac operation, check for 120 Vac at test points (9) and (7) after pressing reset pushbutton (10). If voltage is 0, replace flame safeguard control circuit card by loosening two screws (11) and lifting card out.

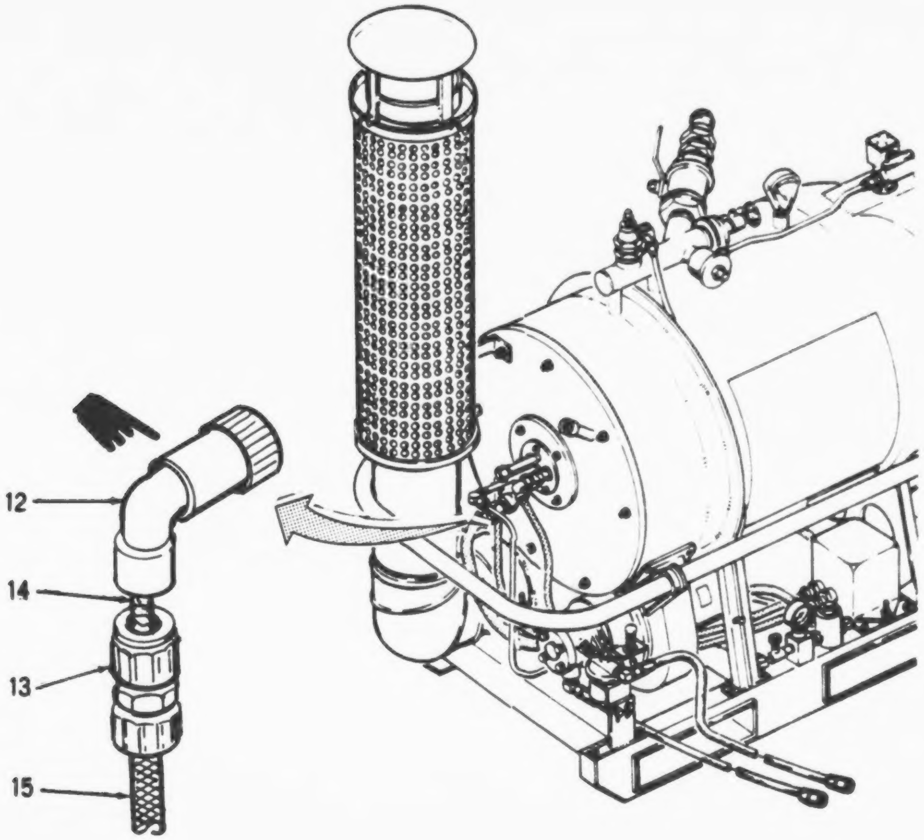


5-7. REPAIR PROCEDURES (CONT'D)

m. UV Scanner and Flame Safeguard Control Test and Repair (Cont'd)

12. To remove UV scanner, go to step 7 and remove flame safeguard control circuit card. Disconnect two wires at terminals S1 and S2. Disconnect UV scanner (12) at burner head assembly and unscrew conduit nut (13). Pull UV scanner wires out of conduit.

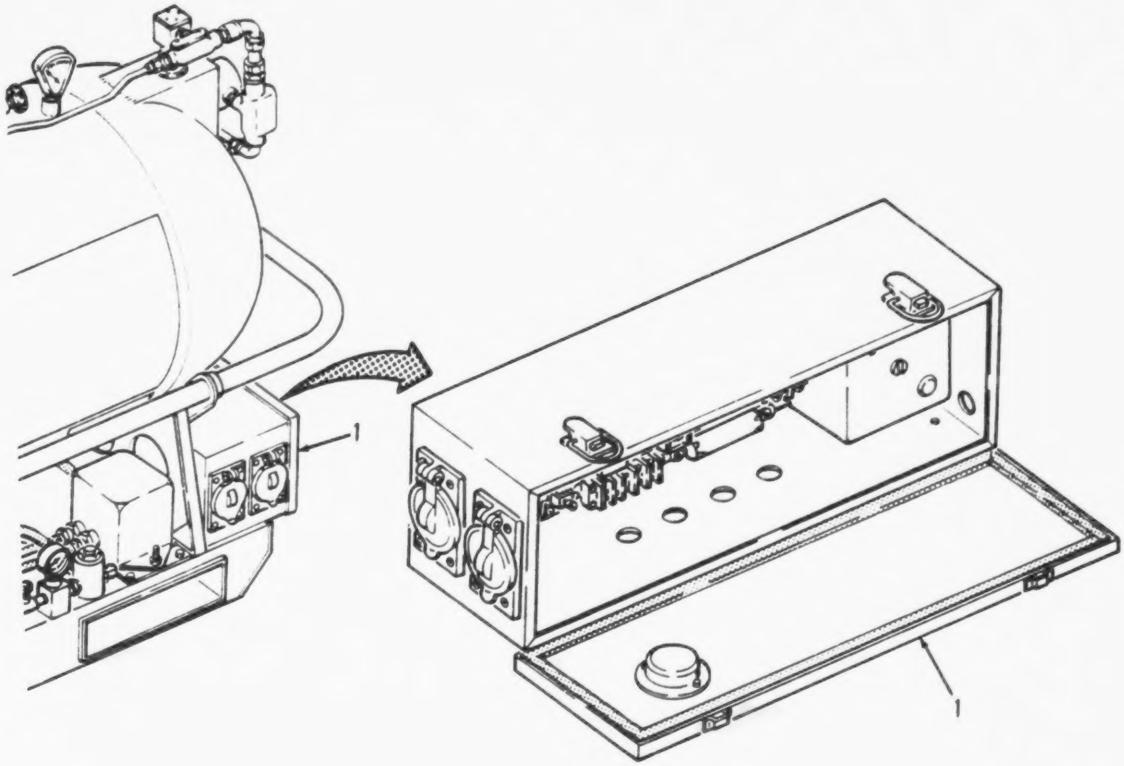
13. To install UV scanner, insert UV scanner wires (14) in conduit (15). Screw conduit nut (13) to UV scanner (12) until connection is tight. Screw UV scanner (12) to scanner tube at burner head. Connect two wires to terminals S1 and S2. Install flame safeguard control circuit card (step 10).



5-7. REPAIR PROCEDURES (CONT'D)

m. UV Scanner and Flame Safeguard Control Test and Repair (Cont'd)

14. Close lid (1) on water heater control box and turn off power limit switch.



5-7. REPAIR PROCEDURES (CONT'D)

n. Operating Limit and High Limit Controls. The operating limit and high limit controls are identical except that the operating limit control has a control knob and a dial calibrated from 0 to 250°F (121°C). The high limit control has a plain cover and protected (covered) screwdriver adjustment that is set at the factory. Because the two controls are mounted differently, the removal and installation procedures are not the same. Repair each control by replacement of the complete control. Replace the controls as follows:

WARNING

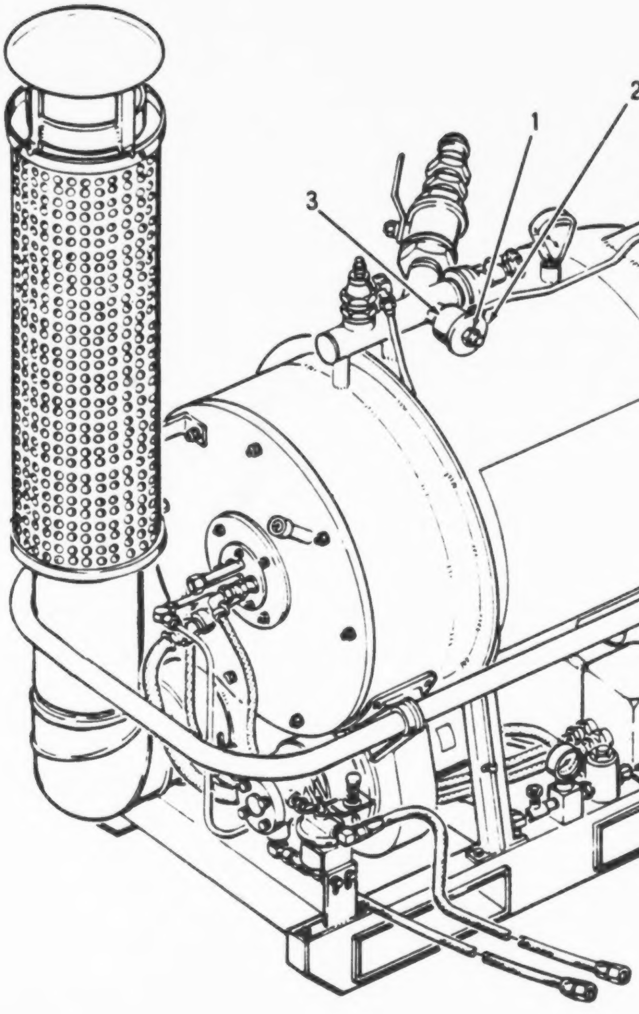
Electrical power furnished to the water heater can be hazardous to life. Do not work with live circuits. Make certain ac power is removed from the water heater before performing the following procedures.

Ensure water heater is cold before servicing the high limit temperature control. The water vessel becomes hot during operation and burns or bodily injury may result from contact with the water heater before it cools.

5-7. REPAIR PROCEDURES (CONT'D)

n. Operating Limit and High Limit Controls (Cont'd)

1. Unscrew cap (1) and remove cover plate (2) on high limit control (3).



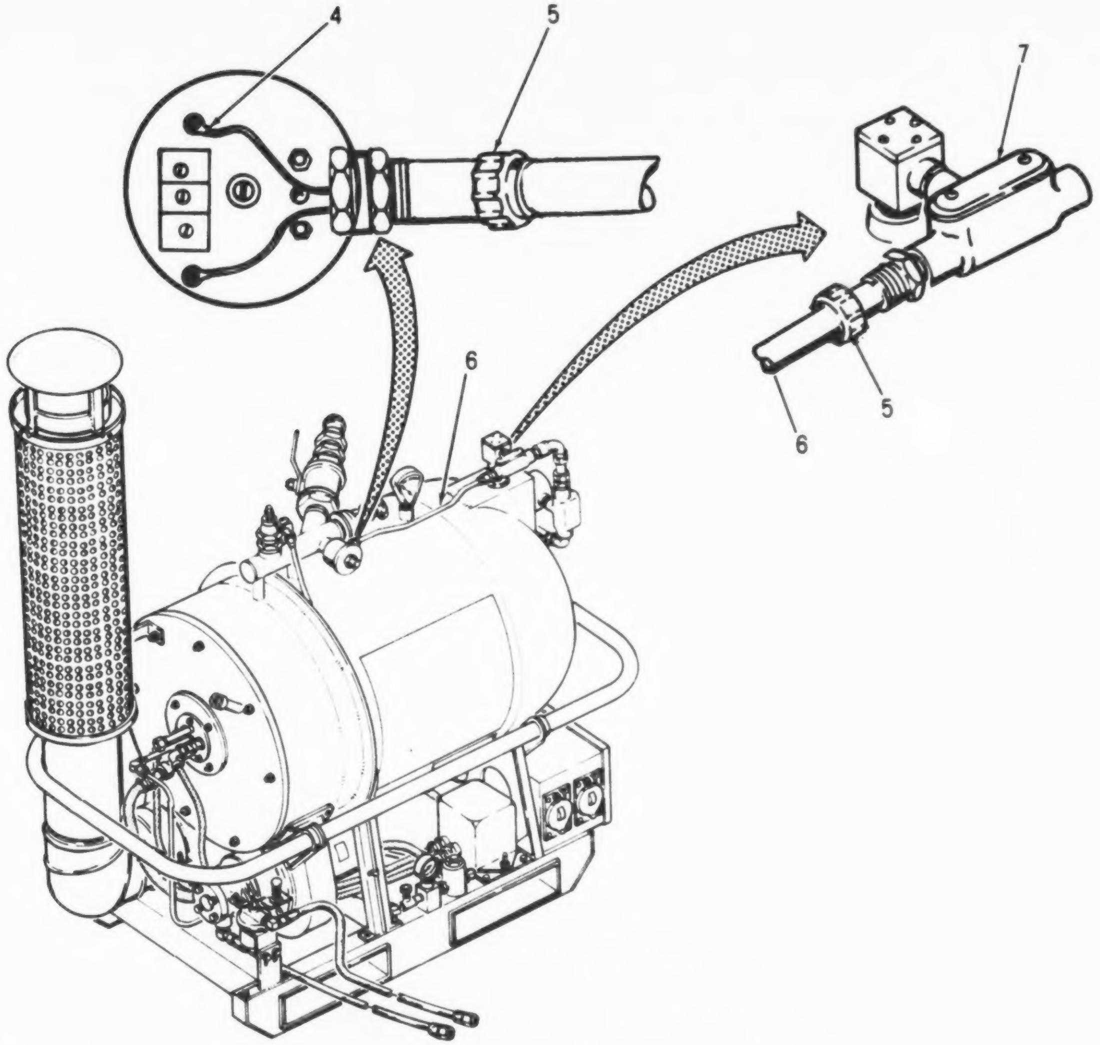
5-7. REPAIR PROCEDURES (CONT'D)

n. Operating Limit and High Limit Controls (Cont'd)

2. Disconnect two wires (4).

3. Loosen conduit nut (5) on each end of conduit (6) and slide nut toward center of conduit.

4. Open inspection plate (7) and pull wires (4) until wires do not extend beyond end of conduit (6).



5-7. REPAIR PROCEDURES (CONT'D)

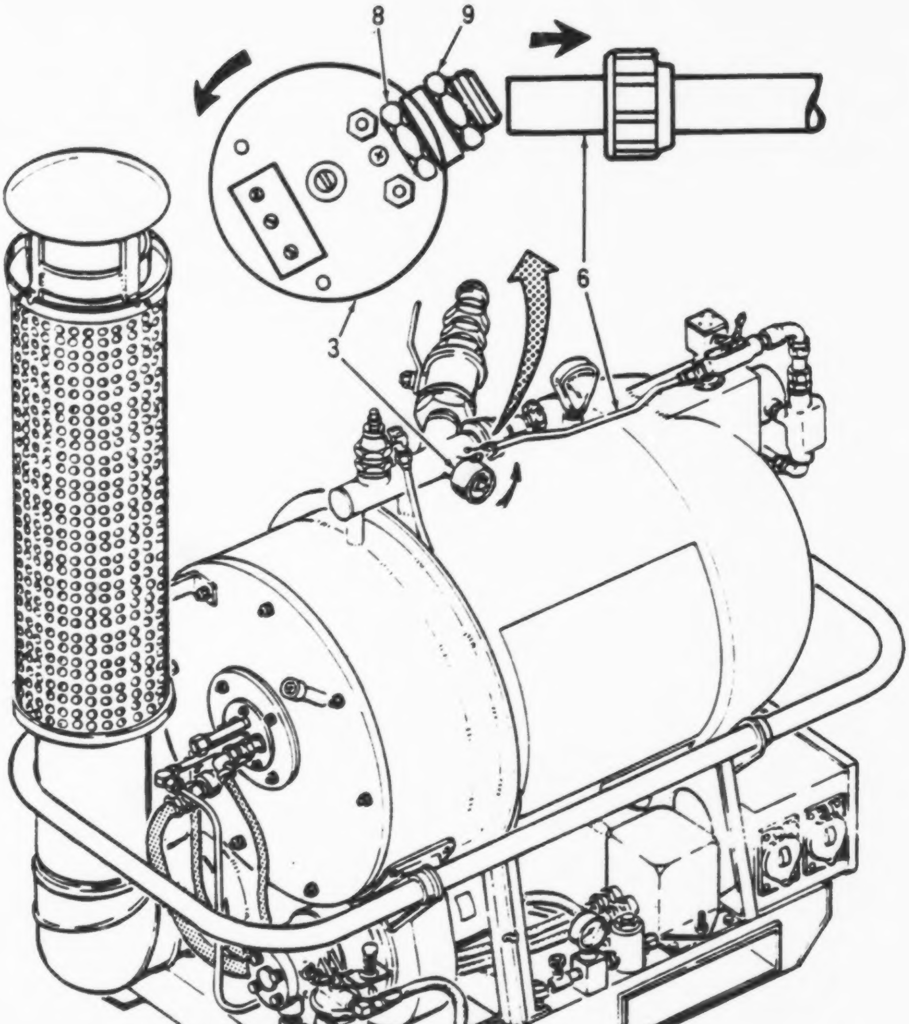
n. Operating Limit and High Limit Controls (Cont'd)

5. Push conduit (6) to right while turning limit control (3) counterclockwise until control is clear of manifold. Remove limit control from manifold by continuing to turn counterclockwise.

6. Unscrew nut (8) and remove raintight connector (9).

NOTE

Before installing the replacement high limit control, coat threads with pipe joint compound (14, Appendix E).

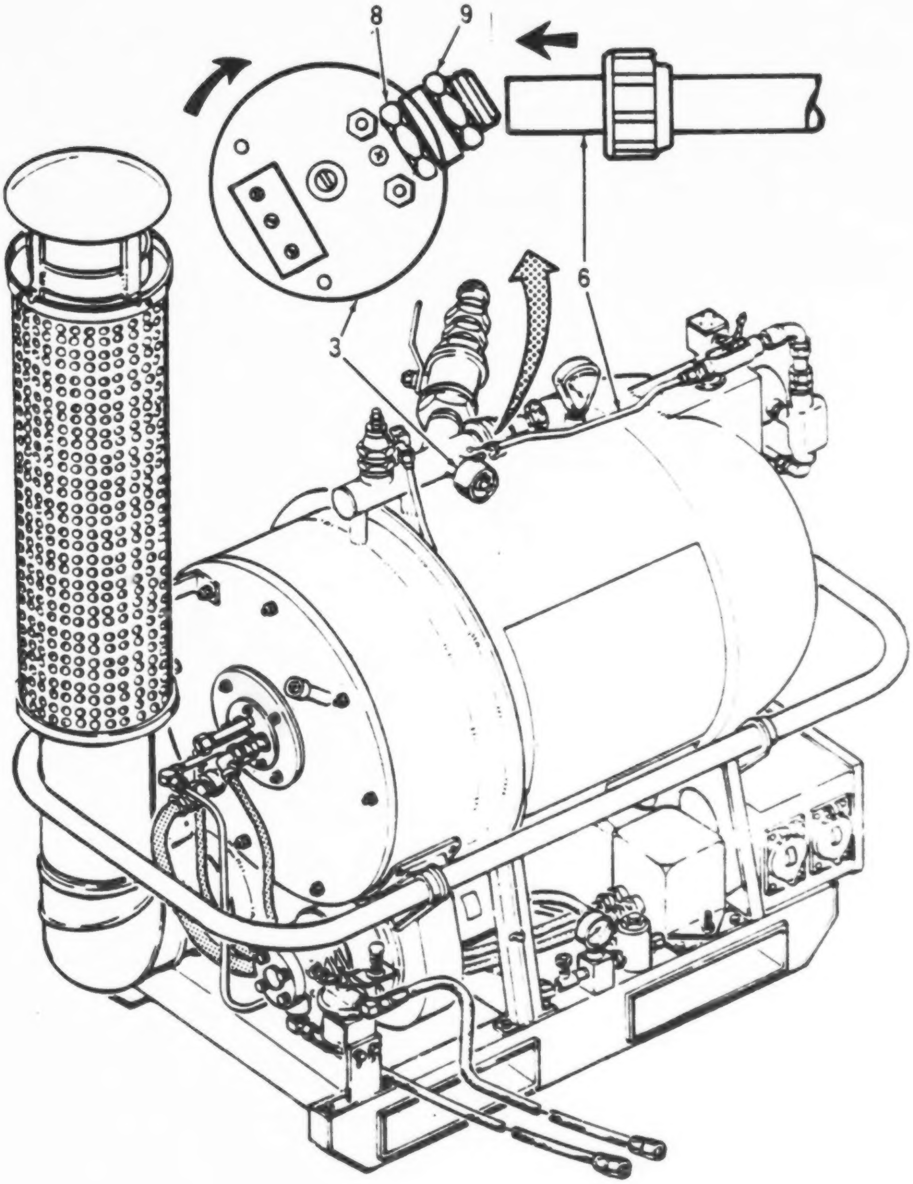


5-7. REPAIR PROCEDURES (CONT'D)

n. Operating Limit and High Limit Controls (Cont'd)

7. Insert raintight connector (9) into high limit control housing (3) and secure with nut (8).

8. Install high limit control (3) in manifold and turn clockwise. On last turn, insert end of conduit (6) into control housing and push conduit to left into housing.



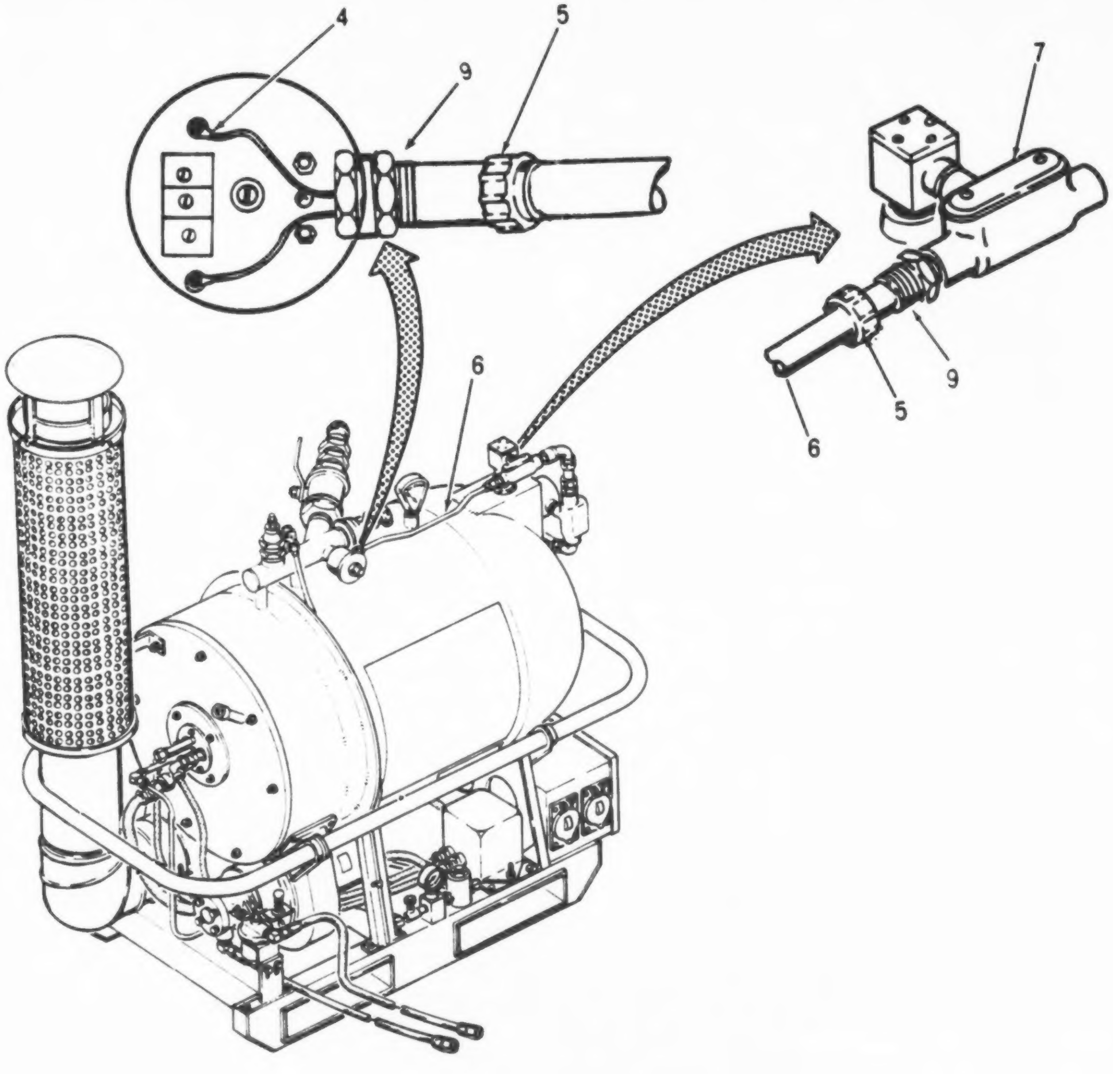
5-7. REPAIR PROCEDURES (CONT'D)

n. Operating Limit and High Limit Controls (Cont'd)

9. Push conduit nuts (5) to raintight connectors (9) and tighten nut.

10. Pull wires (4) out of conduit end (6) and secure two wires (4).

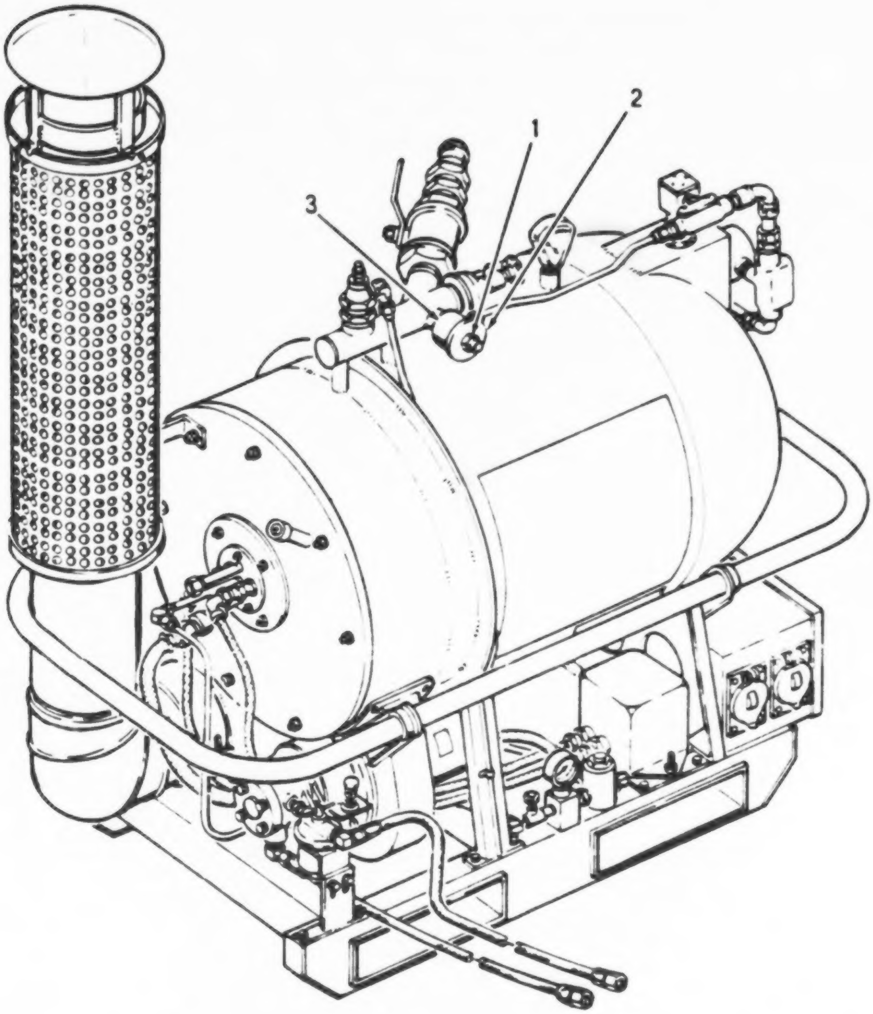
11. Secure inspection plate (7).



5-7. REPAIR PROCEDURES (CONT'D)

n. Operating Limit and High Limit Controls (Cont'd)

12. Place cover plate (2) on high limit control (3) and screw on cap (1).

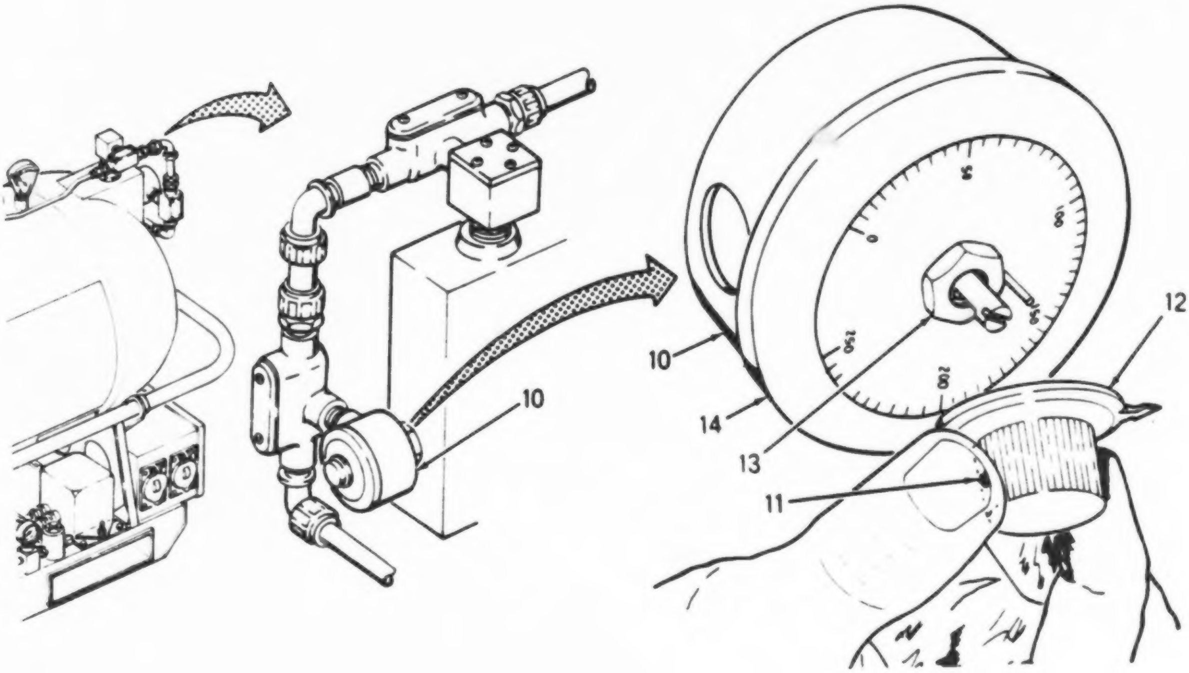


5-7. REPAIR PROCEDURES (CONT'D)

n. Operating Limit and High Limit Controls (Cont'd)

13. At operating control (10) loosen setscrew (11) and lift control knob (12) up.

14. Unscrew nut (13) and remove cover plate (14).



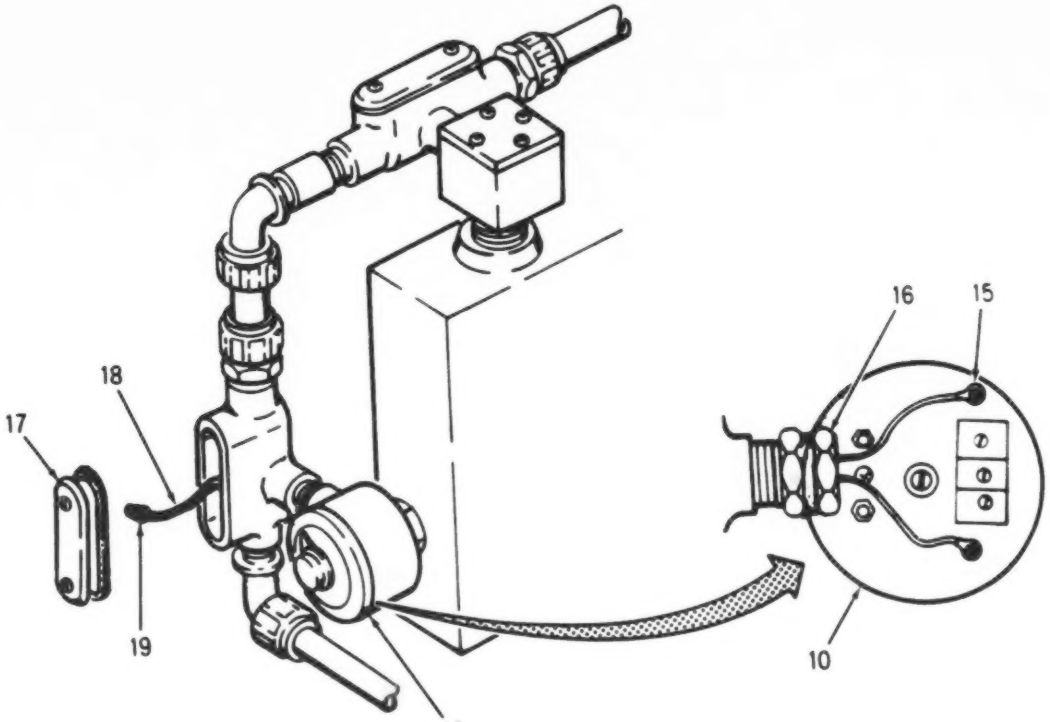
5-7. REPAIR PROCEDURES (CONT'D)

n. Operating Limit and High Limit Controls (Cont'd)

15. Disconnect two wires (15) and remove nut (16) from end of conduit.

16. Remove inspection plate (17) and pull wires (18) out of operating control housing (10).

17. Disconnect wire nuts (19) and push lower wire down in conduit.



5-7. REPAIR PROCEDURES (CONT'D)

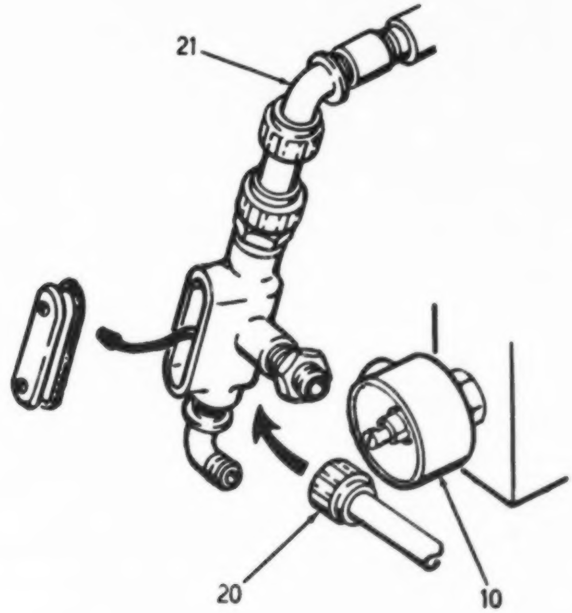
n. Operating Limit and High Limit Controls (Cont'd)

18. Disconnect nut (20) and turn conduit assembly at connector (21) to left.

19. Unscrew operating control (10) by turning counterclockwise.

NOTE

Before installing the replacement operating limit control, coat threads with pipe joint compound (14, Appendix E).



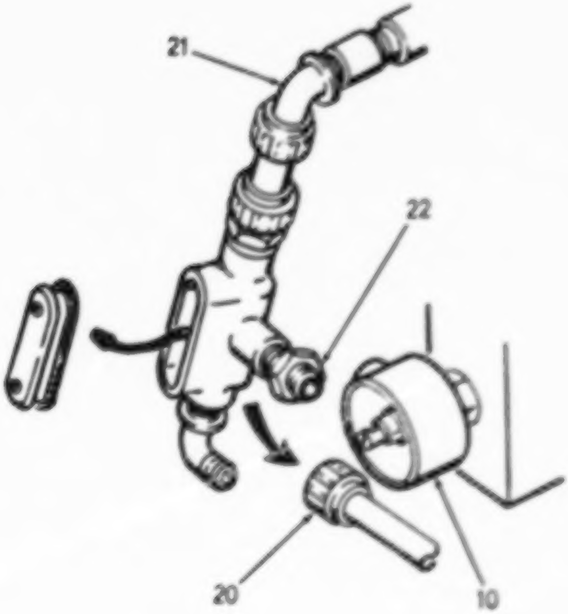
5-7. REPAIR PROCEDURES (CONT'D)

n. Operating Limit and High Limit Controls (Cont'd)

20. Install replacement operating limit control (10) by turning clockwise. Align hole in housing with conduit (22).

21. Turn conduit assembly at elbow (21) until conduit (22) fits inside control housing.

22. Connect nut (20) to elbow.



5-7. REPAIR PROCEDURES (CONT'D)

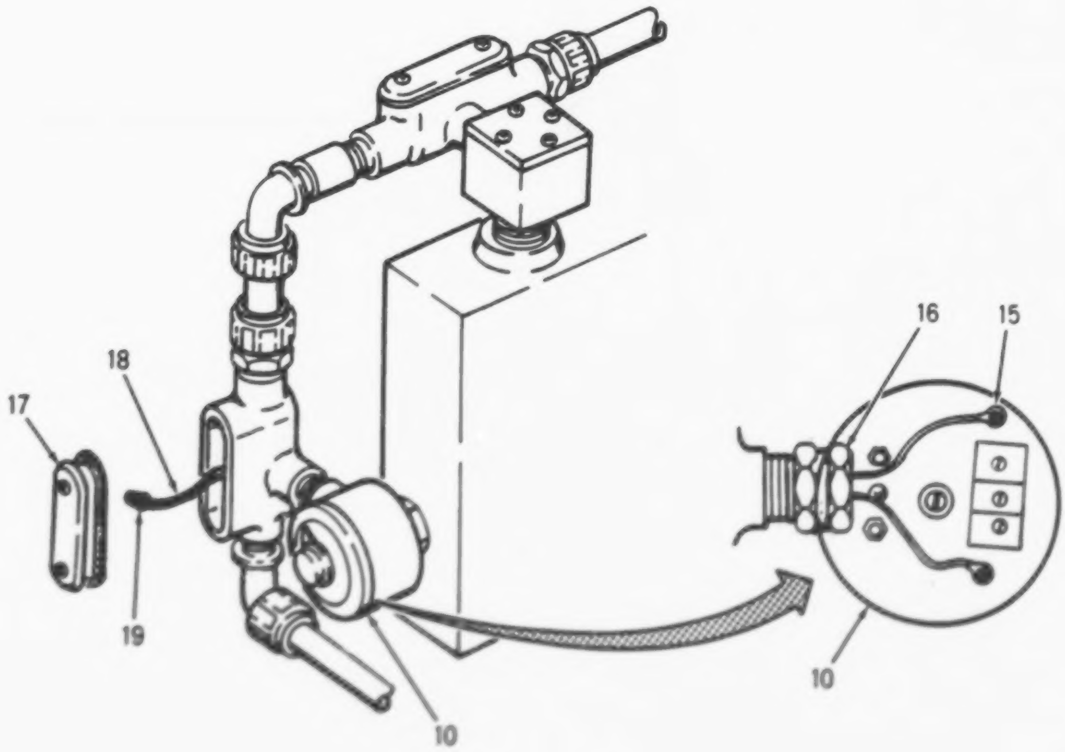
n. Operating Limit and High Limit Controls (Cont'd)

23. Connect wires using wire nuts (19) matching wire colors.

24. Push wires (18) into operating control and secure condulet cover plate (17) with screws.

25. Install conduit nut (16) on end of conduit.

26. Secure two wires (15) to switch.

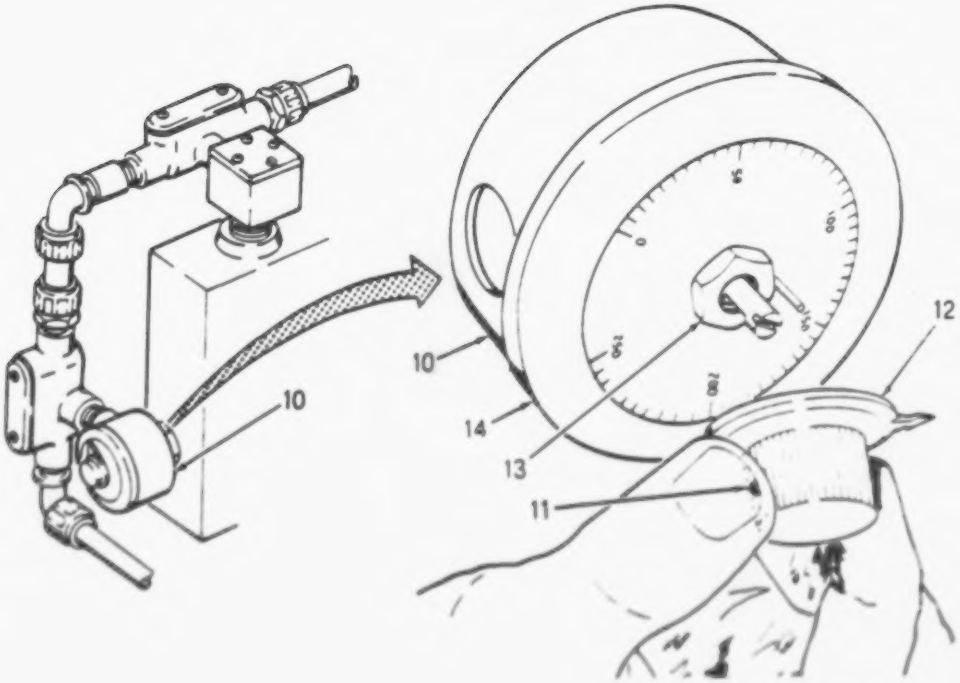


5-7. REPAIR PROCEDURES (CONT'D)

n. Operating Limit and High Limit Controls (Cont'd)

27. Place cover plate (14) over operating control (10) and secure in place with nut (13).

28. Place control knob (12) on control shaft and tighten setscrew (11). Turn knob from 0 to 250° to check pointer calibration. Adjust position by loosening setscrew and move knob to correct position. Tighten setscrew.



5-7. REPAIR PROCEDURES (CONT'D)

o. Low Water Probe Assembly. The low water probe assembly comprises an electrode fitting and an electrode. Only one wire connects to the assembly because the water in the water heater completes the electric circuit. Repair the assembly by replacing the electrode fitting or the electrode. Both parts must be removed from the water heater to replace one part. Removal of the low water probe assembly requires the partial removal of the high limit and operating limit controls. Proceed as follows.

WARNING

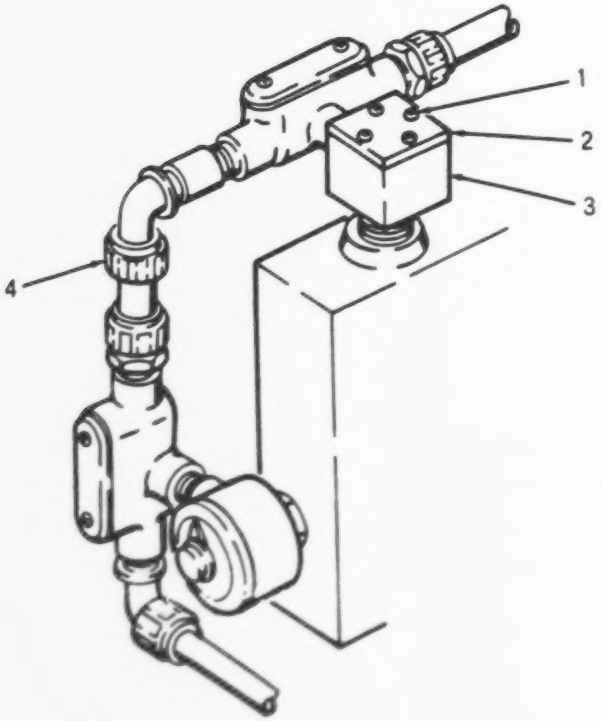
Electrical power furnished to the water heater can be hazardous to life. Do not work with live circuits. Make certain ac power is removed from the water heater before performing the following procedures.

Ensure water heater is cold before servicing the high limit temperature control. The water vessel becomes hot during operation and burns or bodily injury may result from contact with the water heater before it cools.

5-7. REPAIR PROCEDURES (CONT'D)

o. Low Water Probe Assembly (Cont'd)

1. Repeat procedures in paragraph 5-6k, steps 1 through 6.
2. Unscrew four screws (1) and remove cover (2) from electrode fitting (3).
3. Unscrew nut (4).

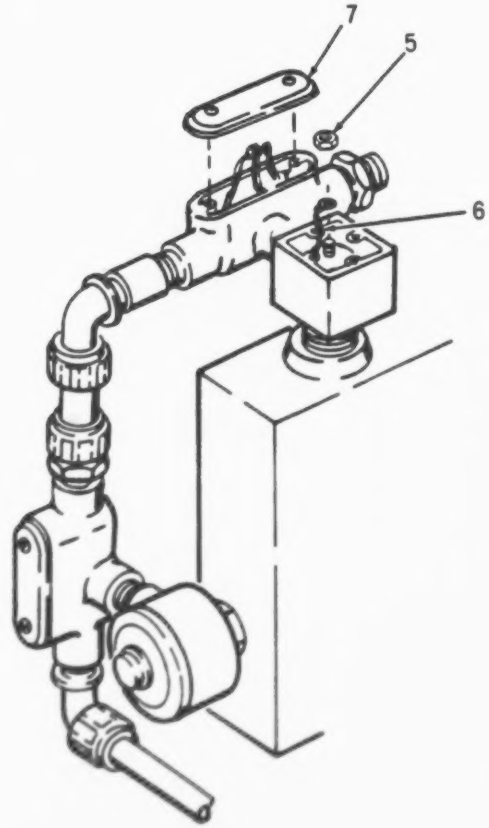


5-7. REPAIR PROCEDURES (CONT'D)

o. Low Water Probe Assembly (Cont'd)

4. Unscrew nut (5) and disconnect wire (6).

5. Remove inspection plate (7) and pull wires from upper conduit out.

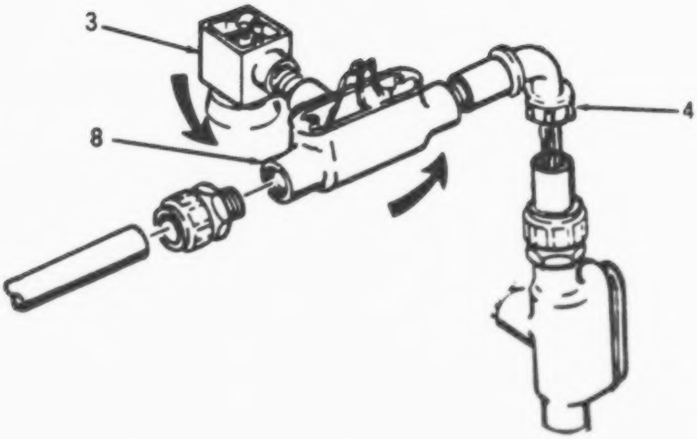


5-7. REPAIR PROCEDURES (CONT'D)

o. Low Water Probe Assembly (Cont'd)

6. With a pipe wrench, rotate condulet (8) until nut (4) is cleared.

7. Rotate electrode fitting (3) counterclockwise until assembly is free from water heater.

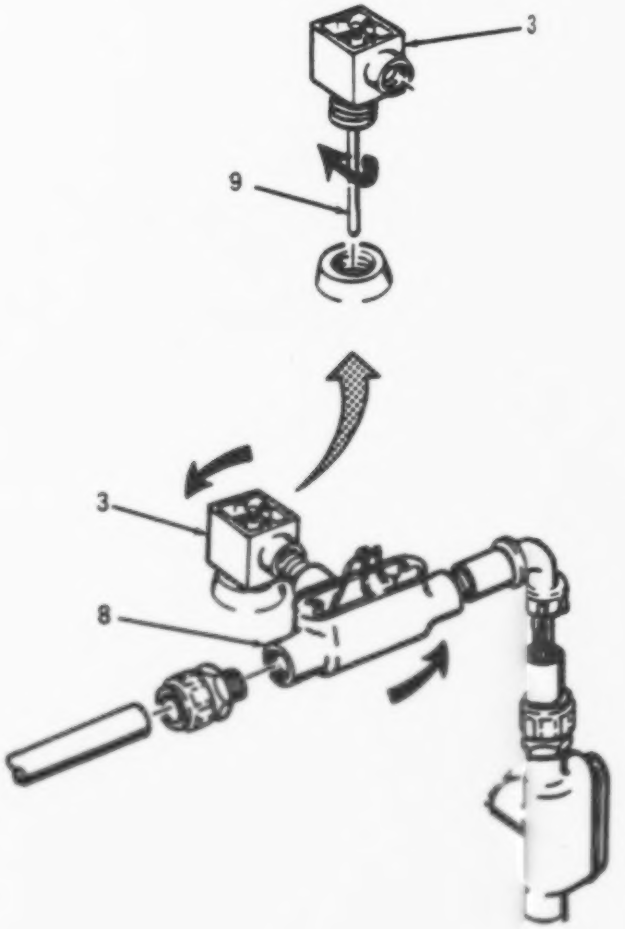


5-7. REPAIR PROCEDURES (CONT'D)

o. Low Water Probe Assembly (Cont'd)

8. Separate condulet (8) from electrode fitting (3) by turning condulet counterclockwise against electrode fitting. Remove low water probe assembly by turning counterclockwise.

9. Separate electrode (9) from electrode fitting (3) by turning counterclockwise.



5-7. REPAIR PROCEDURES (CONT'D)

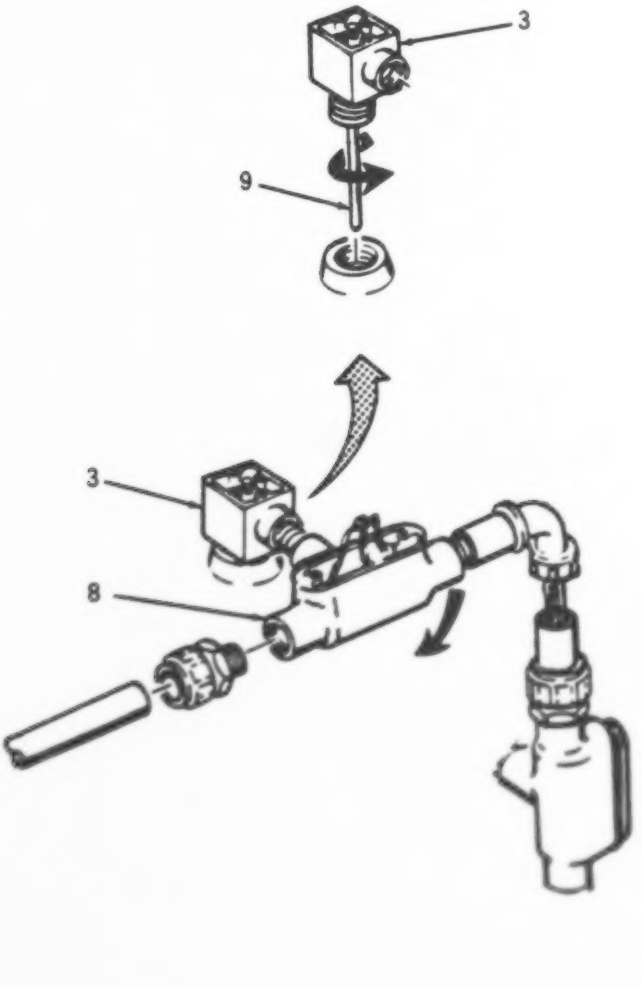
o. Low Water Probe Assembly (Cont'd)

10. Install replacement electrode (9) or electrode fitting (3) by turning electrode clockwise.

NOTE

Before installing the replacement condulet, coat threads with pipe joint compound (14, Appendix E).

11. Assemble electrode fitting (3) and condulet (8) by turning condulet clockwise against electrode fitting.



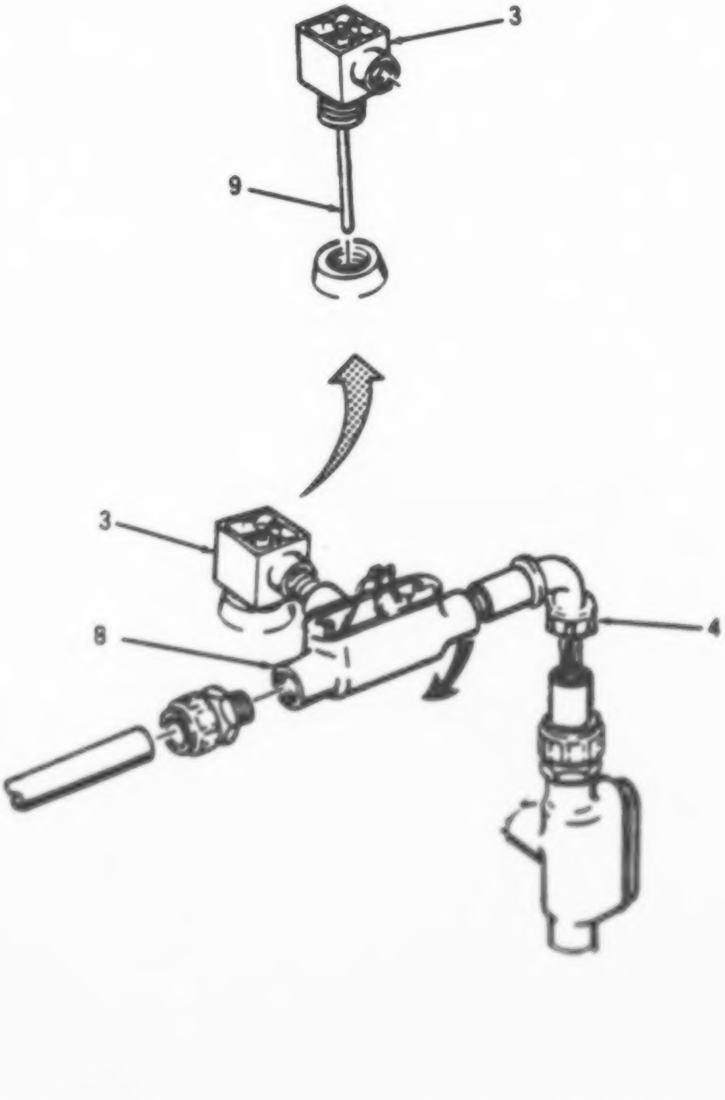
5-7. REPAIR PROCEDURES (CONT'D)

o. Low Water Probe Assembly (Cont'd)

12. Install electrode fitting (3) and condulet assembly (8) by inserting electrode fitting (9) in water heater and turning clockwise.

13. With pipewrench turn condulet (8) clockwise until it mates with conduit nut (4).

14. Tighten nut (4).

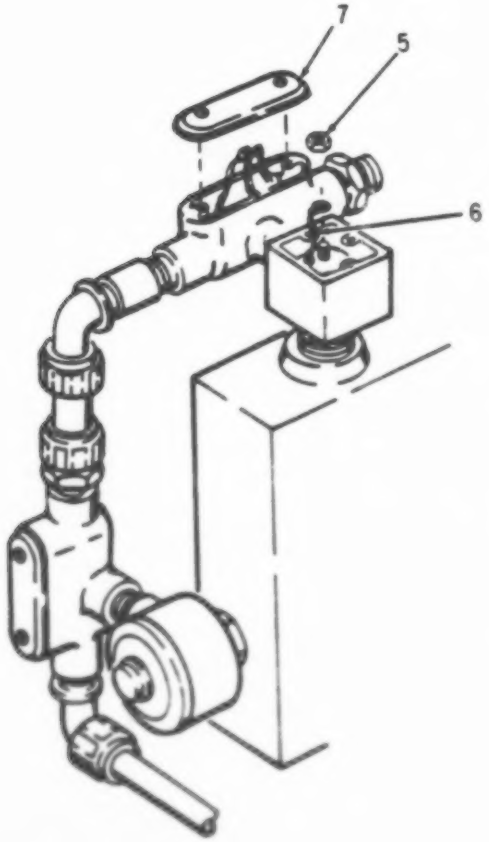


5-7. REPAIR PROCEDURES (CONT'D)

- Low Water Probe Assembly (Cont'd)

15. Feed wires into upper conduit and secure condulet inspection plate (7).

16. Connect short wire (6) to terminal and secure with nut (5).

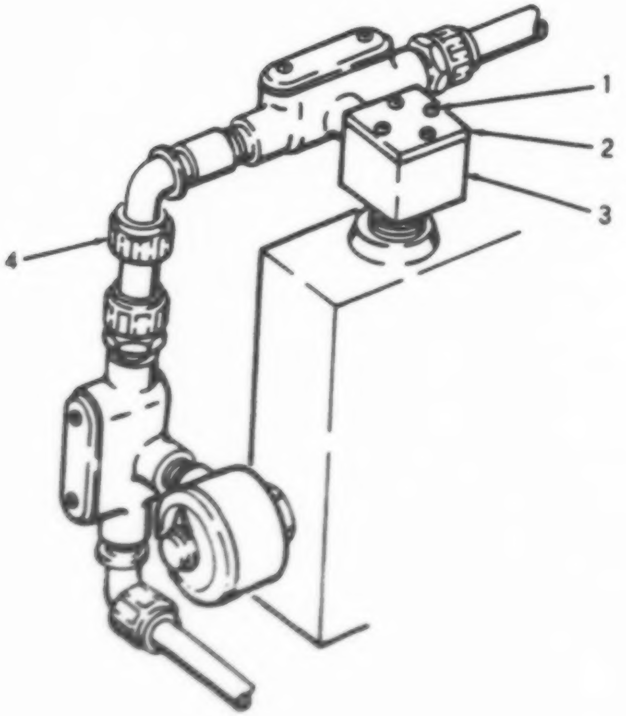


5-7. REPAIR PROCEDURES (CONT'D)

o. Low Water Probe Assembly (Cont'd)

17. Secure cover (2) to electrode fitting with four screws (1).

18. Repeat procedures in paragraph 5-6k, steps 7 through 11.



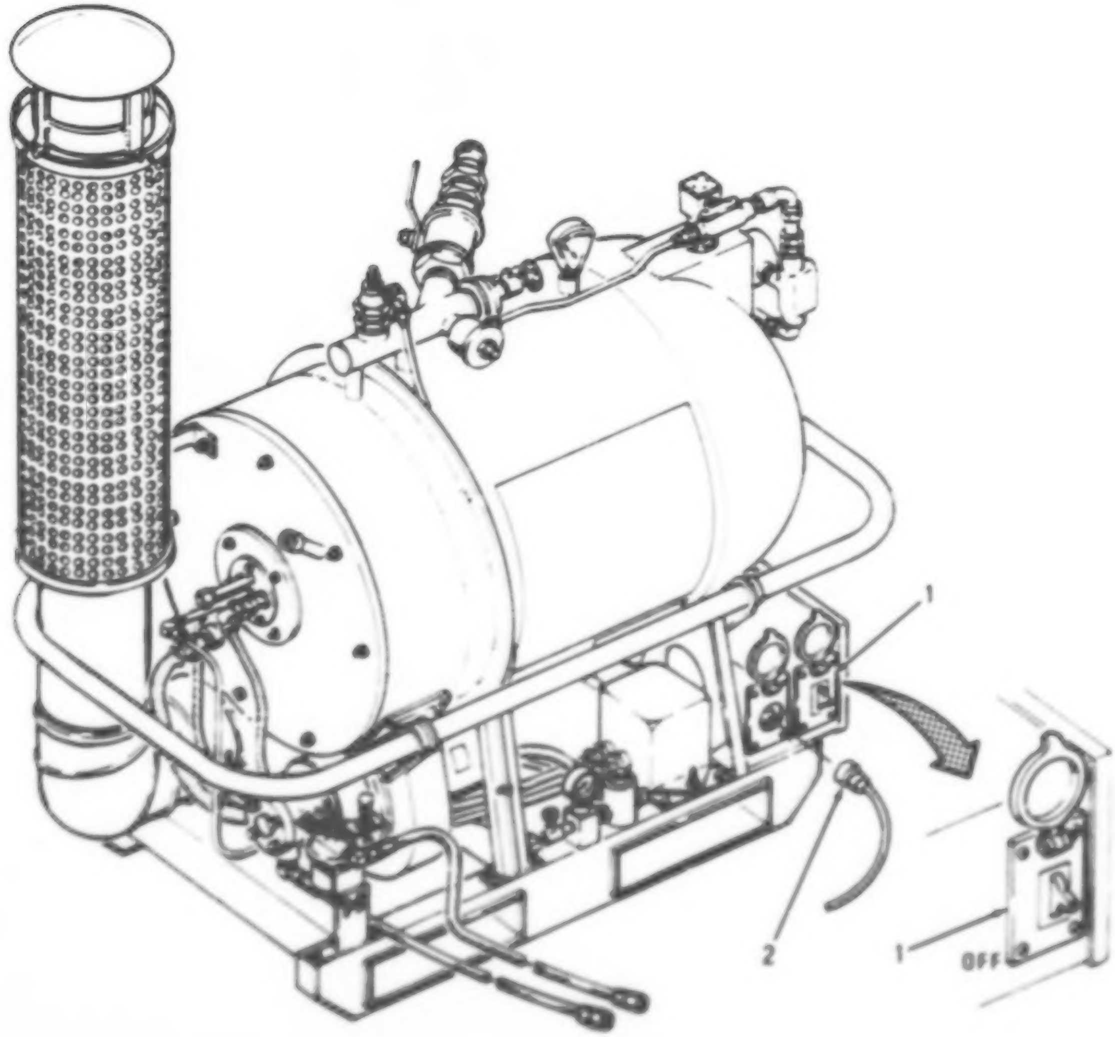
5-7. REPAIR PROCEDURES (CONT'D)

p. Master Control Box Assembly. Test the components in the master control box and repair the unit by replacing the defective component. The flame safeguard control and buzzer repair was described in paragraph 5-70.

WARNING

High voltages that are dangerous to human life may be present. Before working on electrical circuits, remove all power from the water heater.

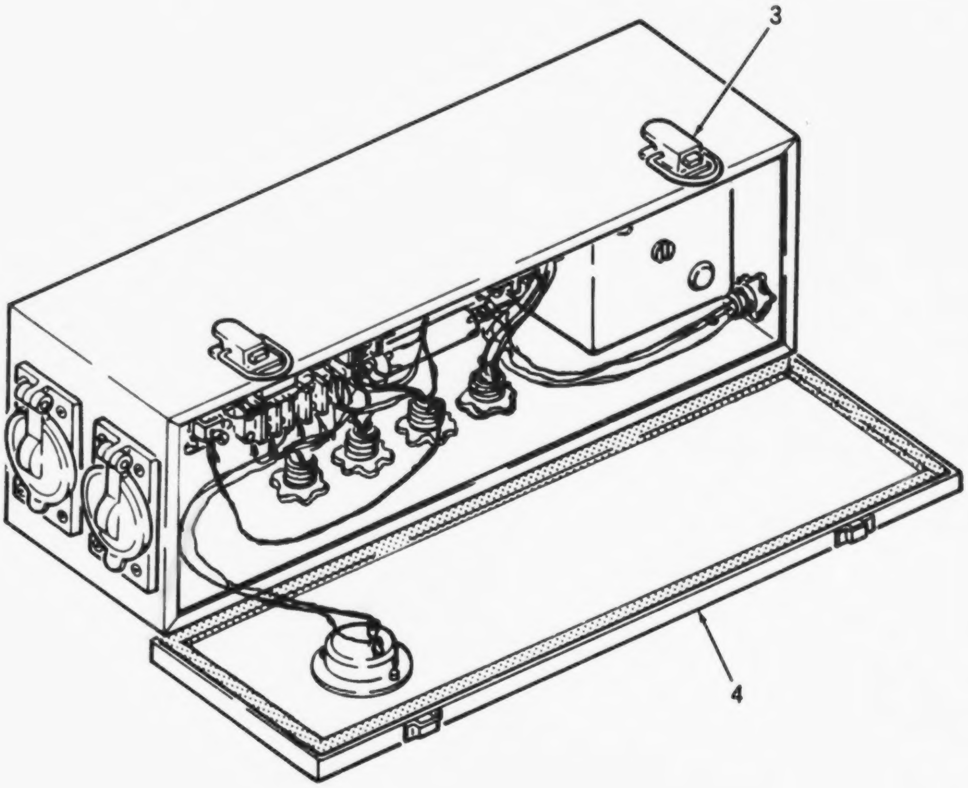
1. Turn off power switch (1) and disconnect power cable (2).



5-7. REPAIR PROCEDURES (CONT'D)

p. Master Control Box Assembly (Cont'd)

2. Use two latches (3) to unlatch control box lid (4) and lower lid exposing components.



5-7. REPAIR PROCEDURES (CONT'D)

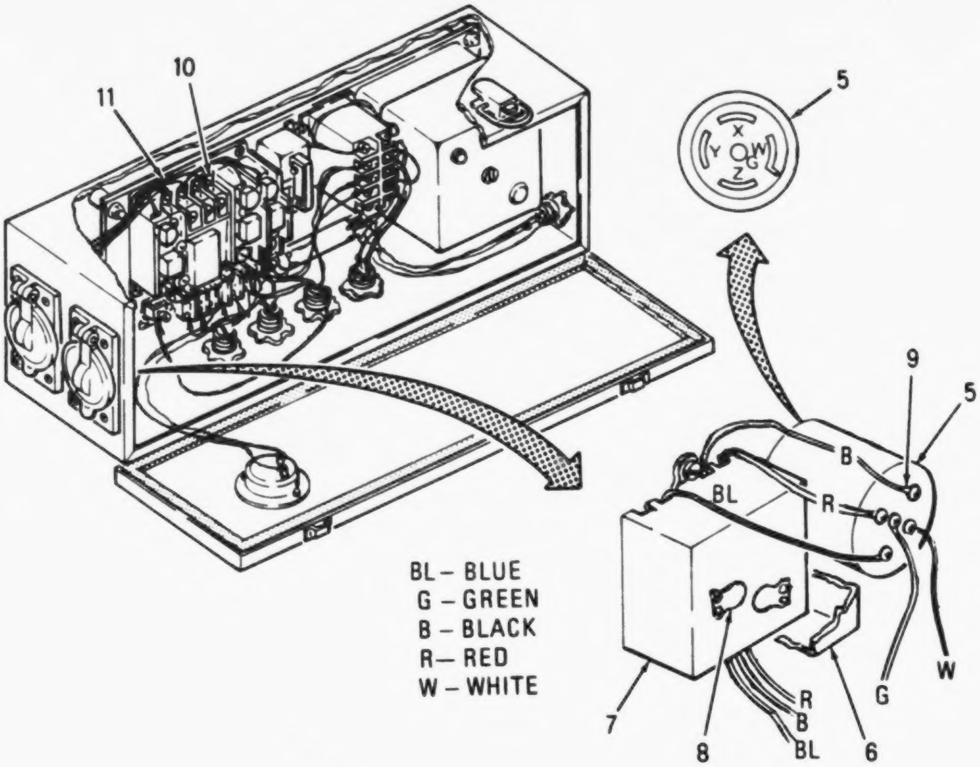
p. Master Control Box Assembly (Cont'd)

3. Inspect components and wires for burns and breaks and replace any component or wire found defective.

4. Using multimeter, check continuity from front of plug (5) to output on each pin. Replace connector (steps 12 and 13) if test fails on any pin.

5. Pull off cover (6) on power limit switch (7) and inspect overload heaters (8) for damage. Replace (steps 15 and 16) if defective.

6. To test power limit switch (7), check continuity from wire terminals (9) on back of plug (5) to terminals (10) at motor contactor (11). With switch (7) turned off, meter reads open circuit. With switch (7) turned on, meter reads continuity on each like colored wire. Replace switch (7) (steps 17 and 18) if continuity test fails.



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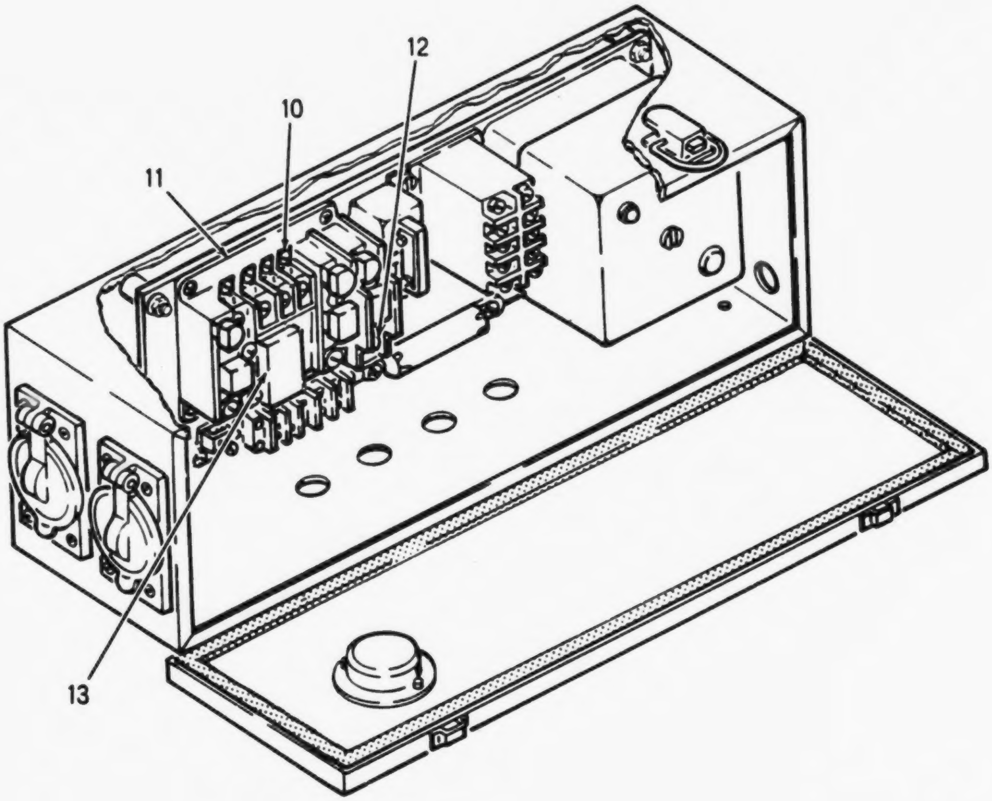
5-7. REPAIR PROCEDURES (CONT'D)

p. Master Control Box Assembly (Cont'd)

7. To test motor contactor (11), check continuity from input terminals (10) to output terminals (12). Meter should read open circuit at each set of terminals (red, blue, black wires). Repeat continuity check at each terminal while pushing up on motor contactor solenoid (13). Meter reads continuity for each like colored wire. Replace motor contactor (11) (steps 23 and 24) if continuity test fails.



5-7. REPAIR PROCEDURES (CONT'D)

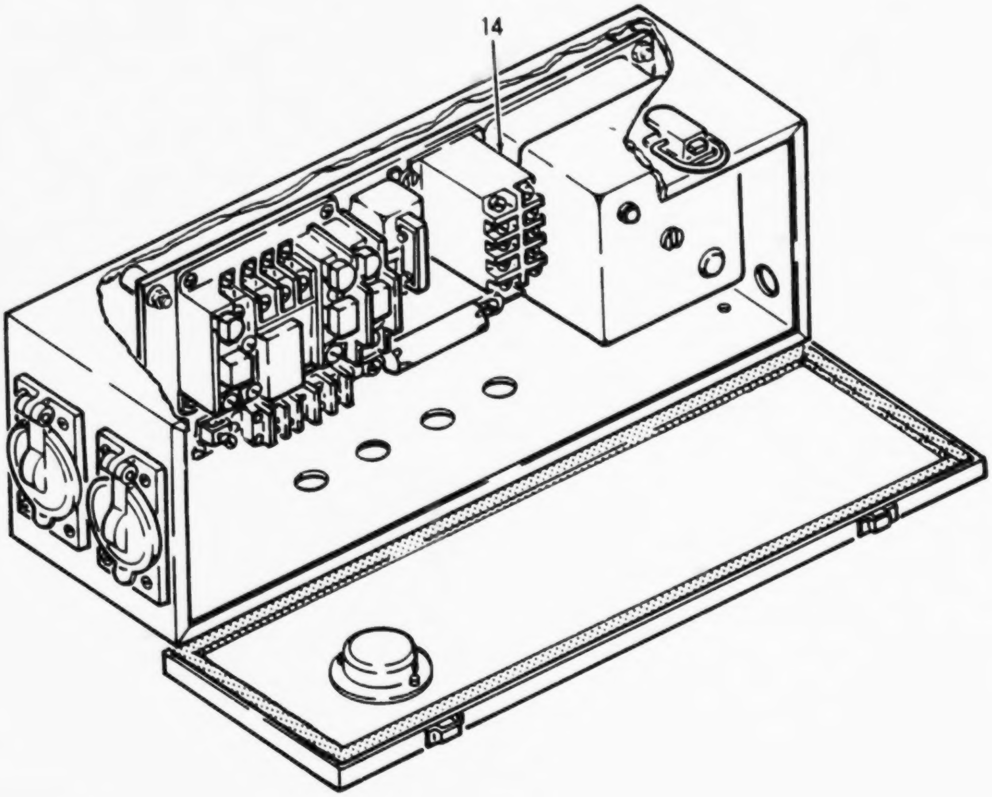
p. Master Control Box Assembly (Cont'd)

8. To test low water relay (14) disconnect terminal lug at terminal 2 and check continuity between terminals 1 and 2. If meter reading is short or open circuited, replace low water relay (steps 19 and 20). Check continuity from either terminal 1 or terminal 2 to chassis ground. If shorted (0-ohms), replace relay. Connect terminal lug to terminal 2.

9. Disconnect terminal lug at terminal 9 and repeat step 8 using terminals 9 and 10. Replace terminal lug at terminal 9.

10. Check continuity between terminals 3 and 4. Meter reads continuity. Replace low water relay if reading not normal.

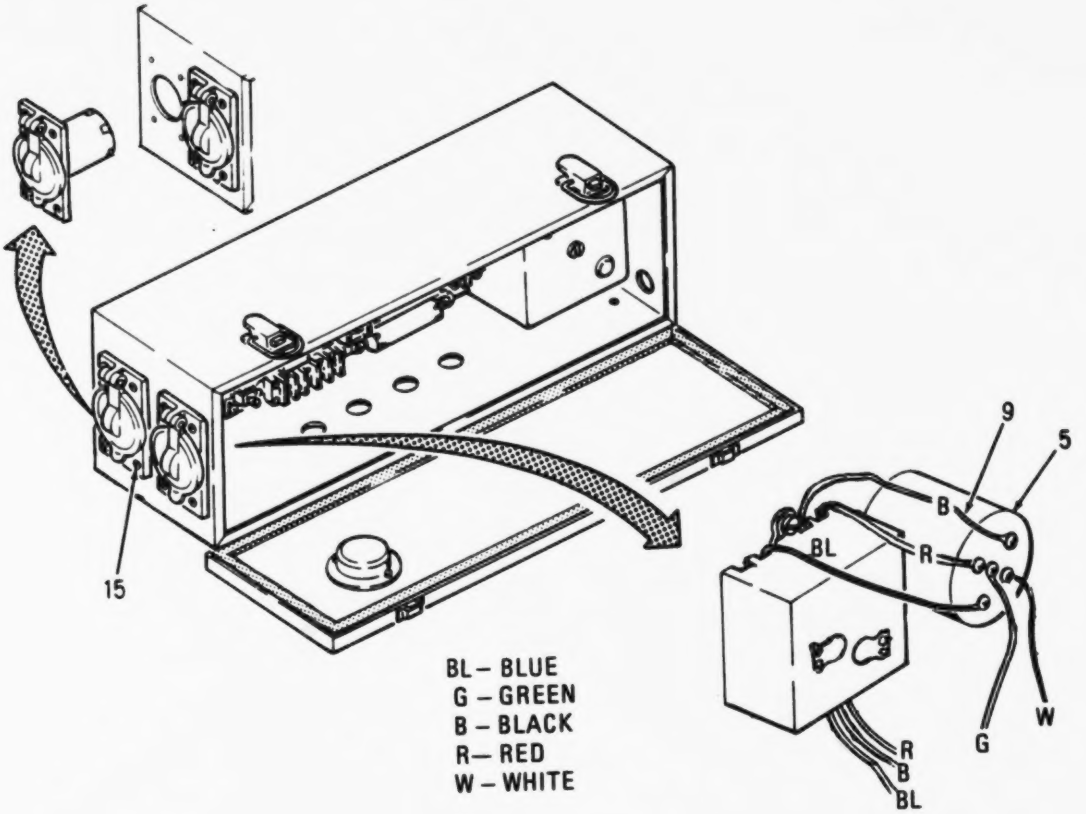
11. Check continuity between terminals 7 and 8. Meter reads open circuit. Replace low water relay if reading not normal.



5-7. REPAIR PROCEDURES (CONT'D)

p. Master Control Box Assembly (Cont'd)

12. To remove plug (5), disconnect wire terminals (9) and unscrew four screws (15). Pull receptacle out from side of control box.

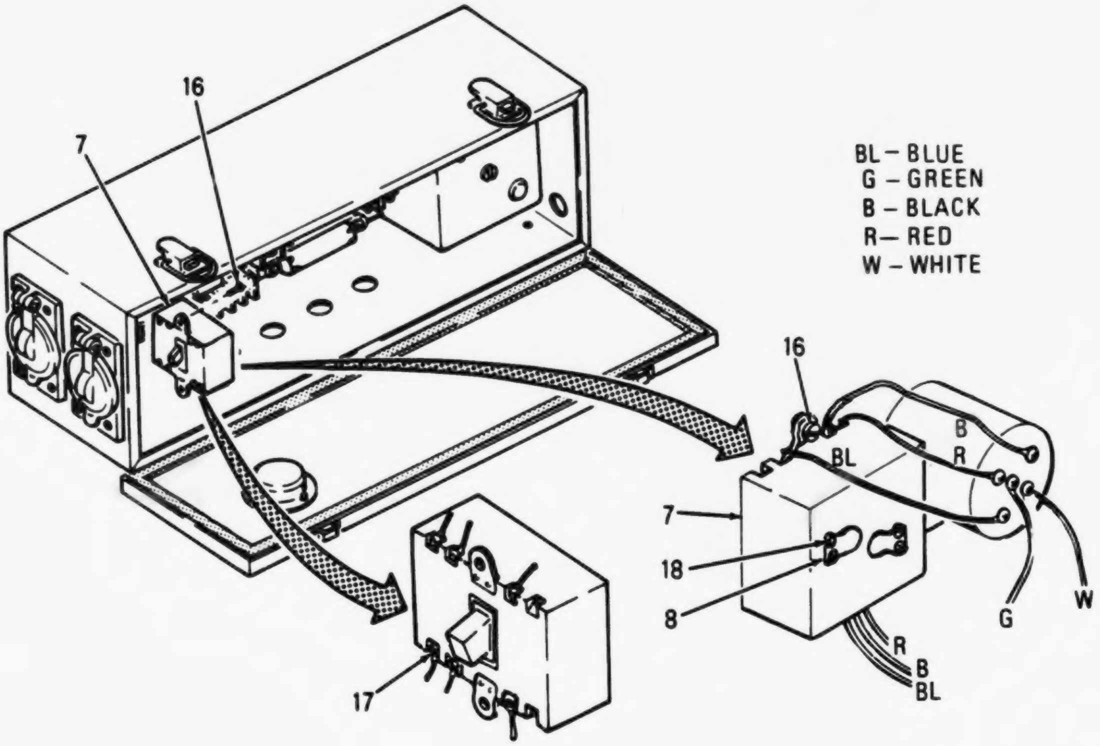


5-7. REPAIR PROCEDURES (CONT'D)

p. Master Control Box Assembly (Cont'd)

13. To remove power limit switch (7), remove two screws (16) and turn switch over to gain access to switch terminals. Tag wires and remove six screws (17) to free switch.

14. Remove two overload heaters (8) by removing two screws (18).



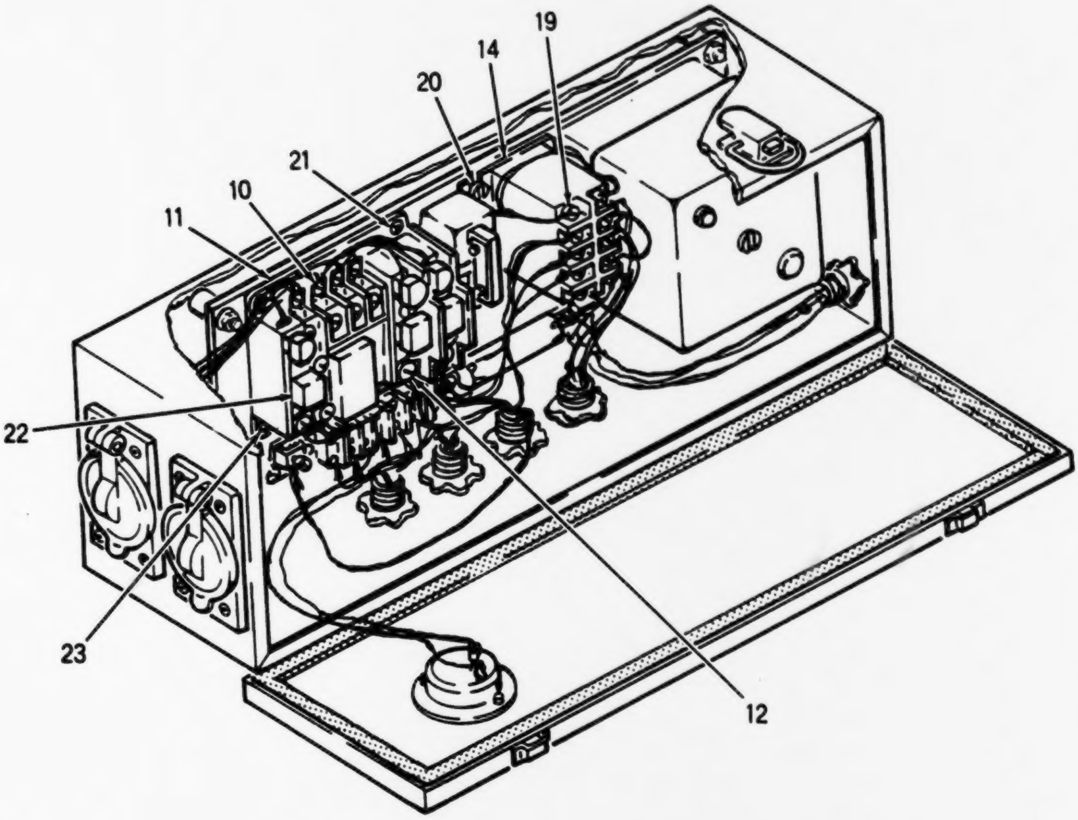
5-7. REPAIR PROCEDURES (CONT'D)

p. Master Control Box Assembly (Cont'd)

15. To remove low water relay (14) label wires and remove eight terminal screws (19) securing wire lugs to terminals. Remove three screws (20) securing relay to control box and remove relay.

16. To remove motor contactor (11), tag wires and disconnect wires at each input (10) and output terminal (12) and unscrew six screws (21). Remove motor contactor.

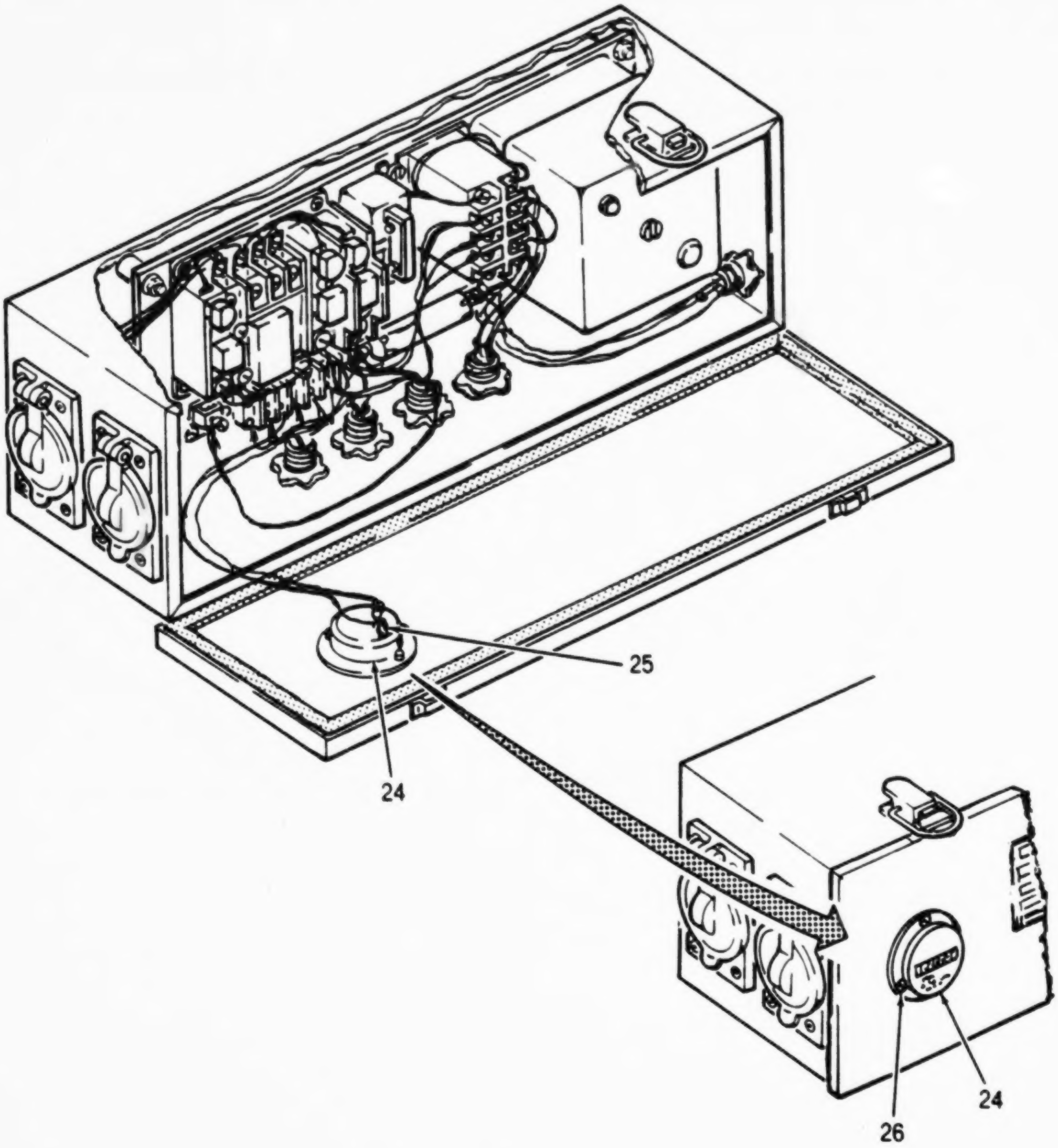
17. Remove contactor heater (22) by removing two screws (23) and lift heater up.



5-7. REPAIR PROCEDURES (CONT'D)

p. Master Control Box Assembly (Cont'd)

18. To remove hour meter (24) disconnect two terminal lugs (25) by unplugging and remove three screws (26). Pull meter out from front.



5-7. REPAIR PROCEDURES (CONT'D)

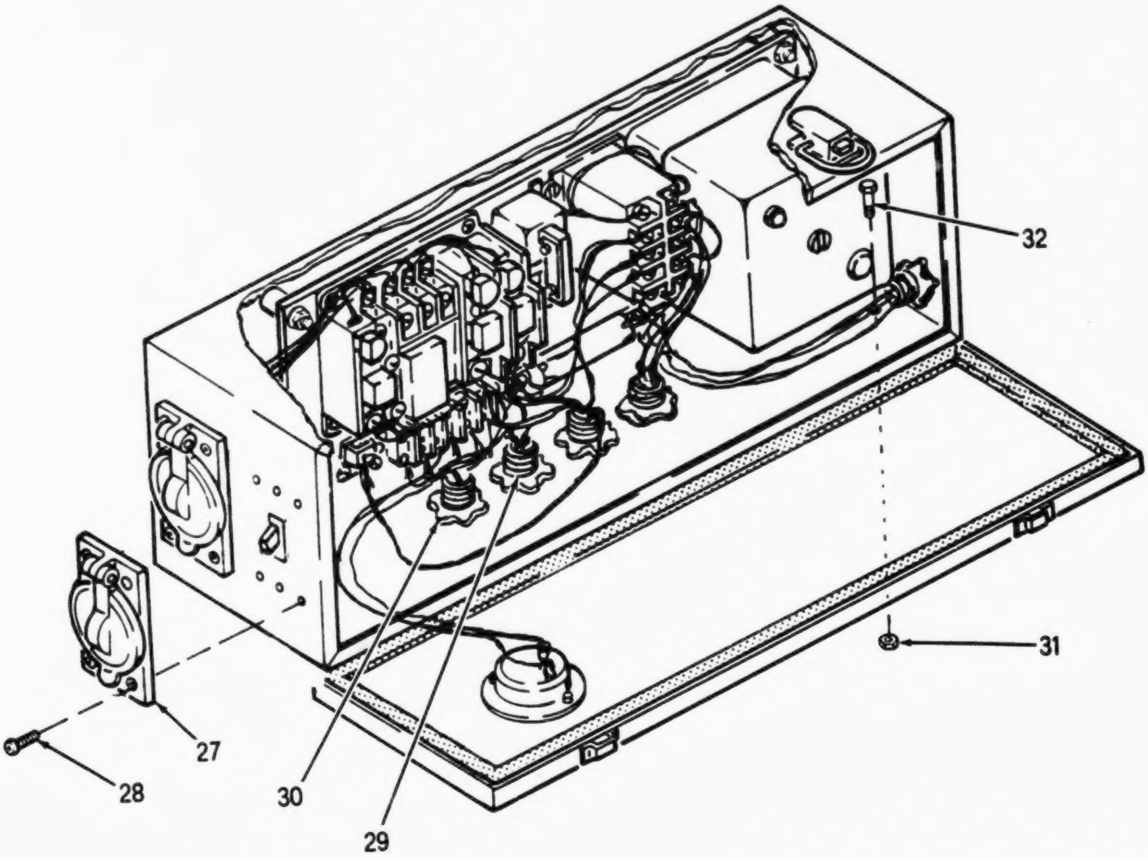
p. Master Control Box Assembly (Cont'd)

19. Remove four screws (28) holding coverplate (27) to control box.

20. To remove mounting panel and control box, tag and disconnect all wires from panel-mounted components.

21. Remove five conduit locknuts (30) and slip five conduit fitting (29) from control box.

22. Remove four nuts (31) and four screws (32) securing control box to skid and remove control box.

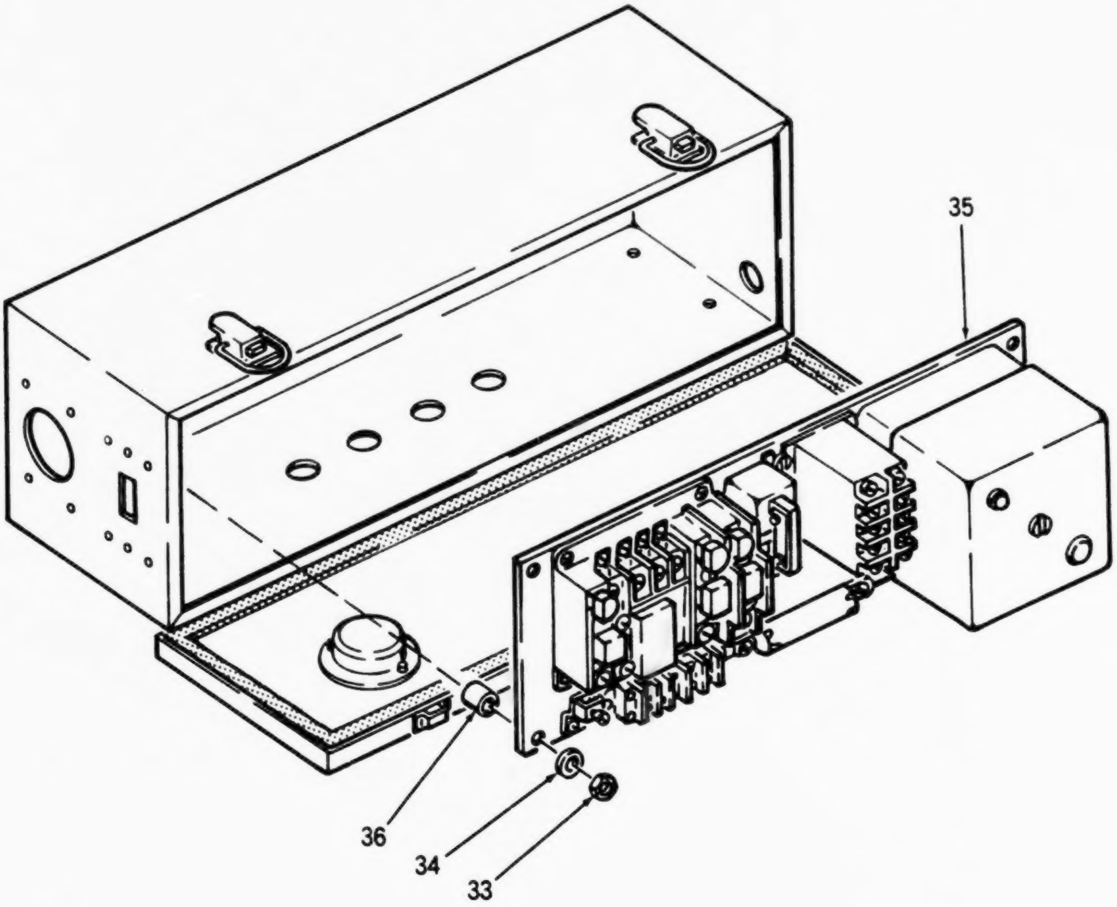


5-7. REPAIR PROCEDURES (CONT'D)

p. Master Control Box Assembly (Cont'd)

23. Remove four nuts (33) four washers (34) and four spacers (36) and remove mounting panel (35).

24. Install mounting panel (35) to control box using four spacers (36), four washers (34) and four nuts (33).



5-7. REPAIR PROCEDURES (CONT'D)

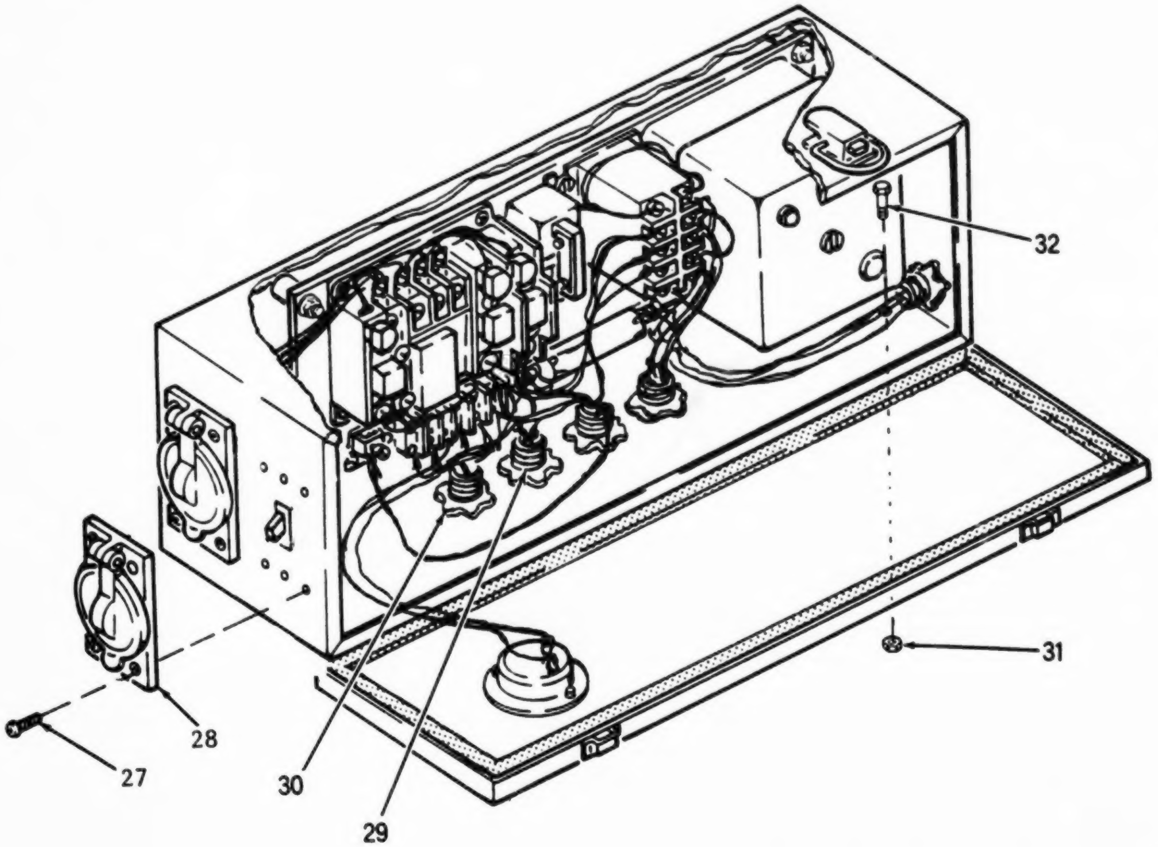
p. Master Control Box Assembly (Cont'd)

25. Install control box on skid and secure with four screws (32) and four nuts (31).

26. Insert five conduit fittings (29) and secure with five lock nuts (30).

27. Connect all tagged wires.

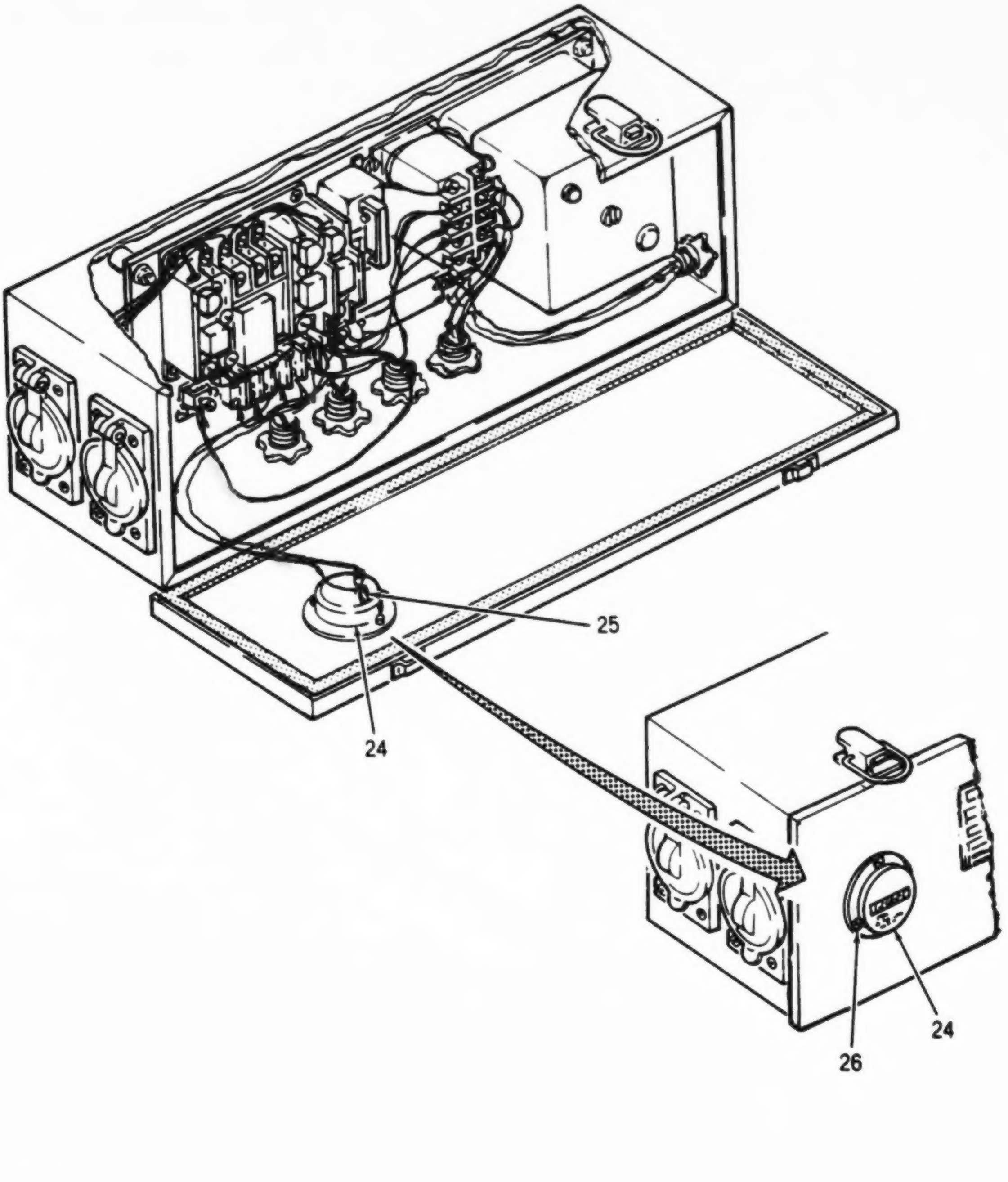
28. Install cover plate (28) and secure with four screws (27).



5-7. REPAIR PROCEDURES (CONT'D)

p. Master Control Box Assembly (Cont'd)

29. Install hour meter (24) by setting in place and securing with three screws (26). Plug two terminal lugs (25) into meter terminal lugs.



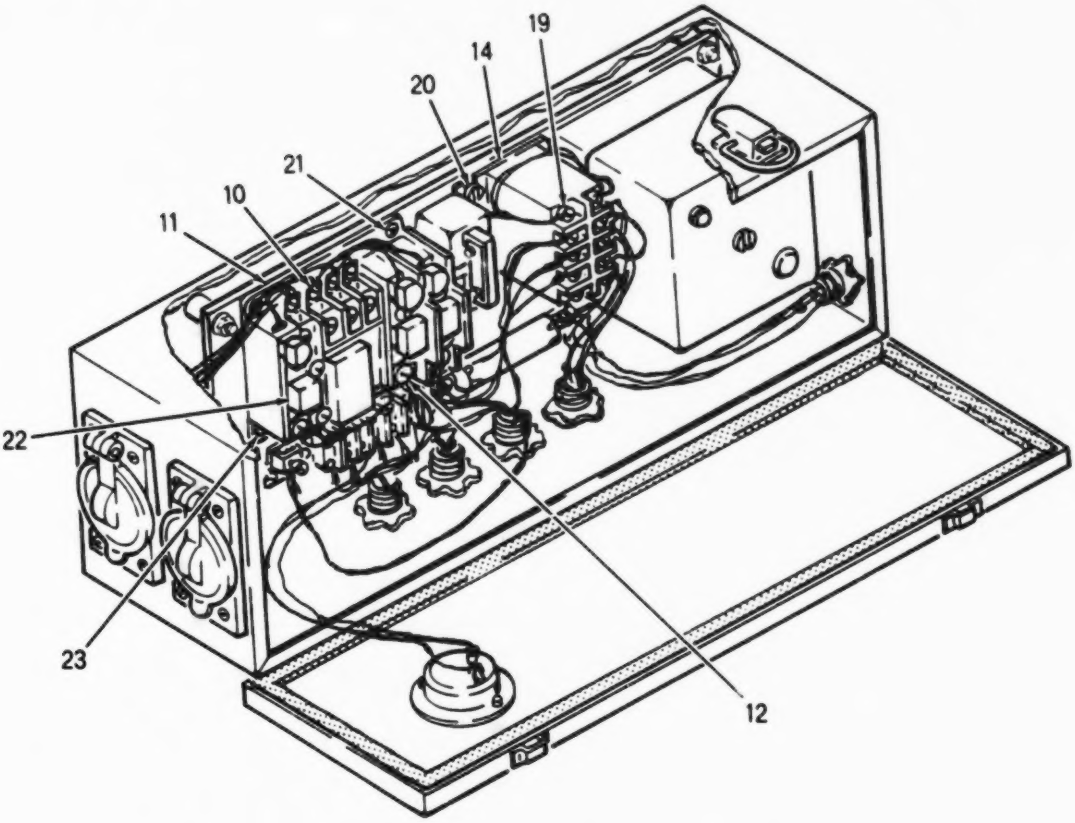
5-7. REPAIR PROCEDURES (CONT'D)

p. Master Control Box Assembly (Cont'd)

30. Install low water relay (14) by setting in place and securing with three screws (20). Secure tagged wire lugs to terminals using eight terminal screws (19).

31. Install motor contactor (11) by setting in place and securing with six screws (21). Secure tagged wires to input terminals (10) and output terminals (12) using terminal screws.

32. Install contactor heater (22) by setting in place and securing with two screws (23).



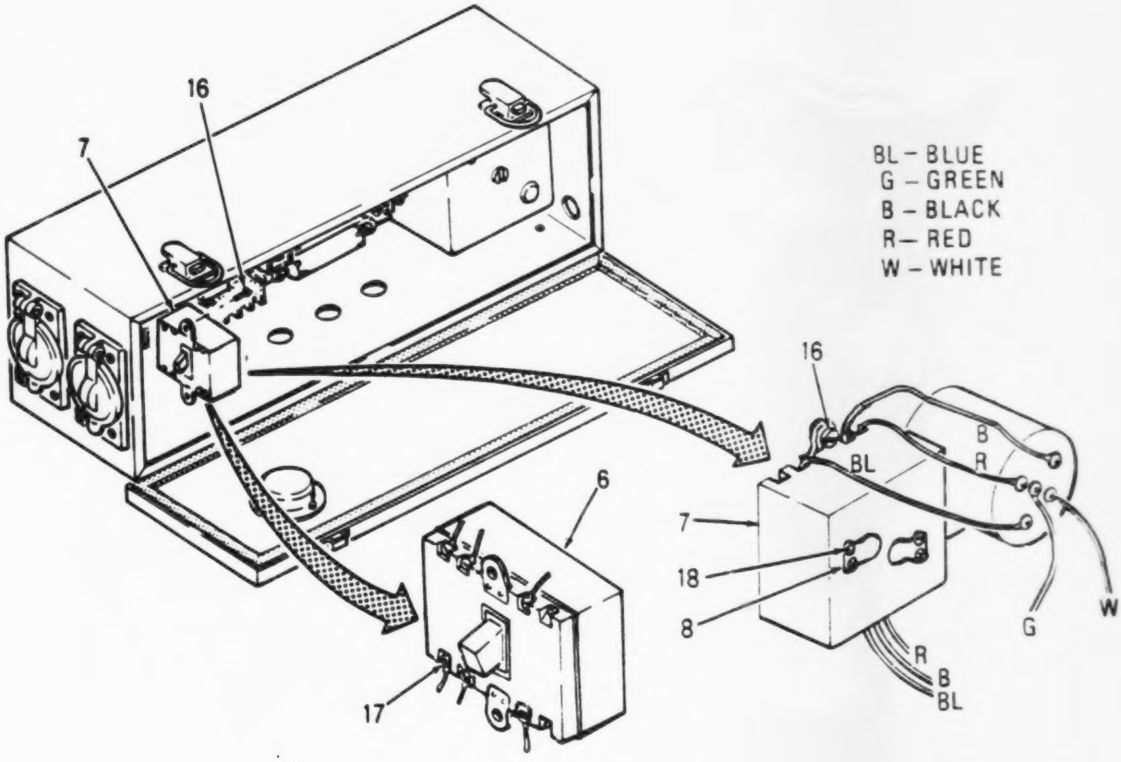
5-7. REPAIR PROCEDURES (CONT'D)

p. Master Control Box Assembly (Cont'd)

33. Install two overload heaters (8) by setting in place and securing with two screws (18).

34. Install replacement switch (7) by connecting tagged wires with six screws (17). Secure switch to control box with two screws (16).

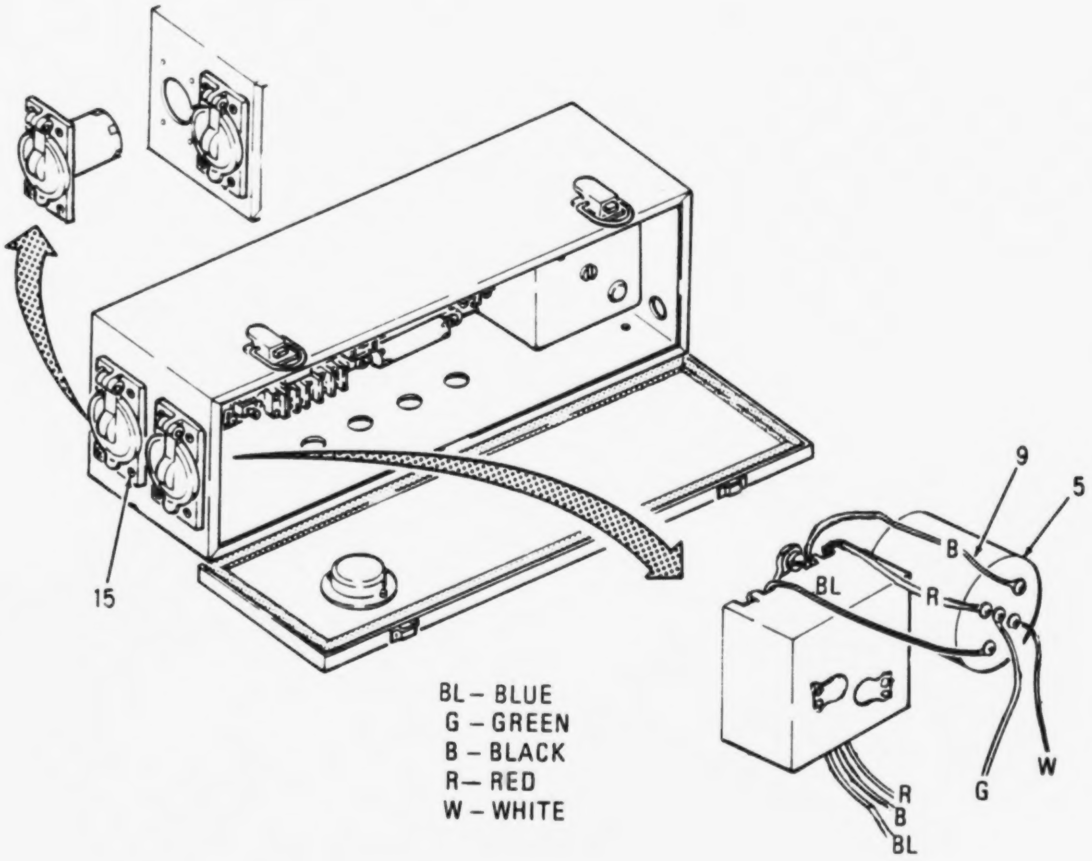
35. Install cover (6) by pressing in place.



5-7. REPAIR PROCEDURES (CONT'D)

p. Master Control Box Assembly (Cont'd)

36. Install replacement plug (5) by setting in place and secure with four screws (15). Connect wire terminals (9) to receptacle terminals as wire color shows.

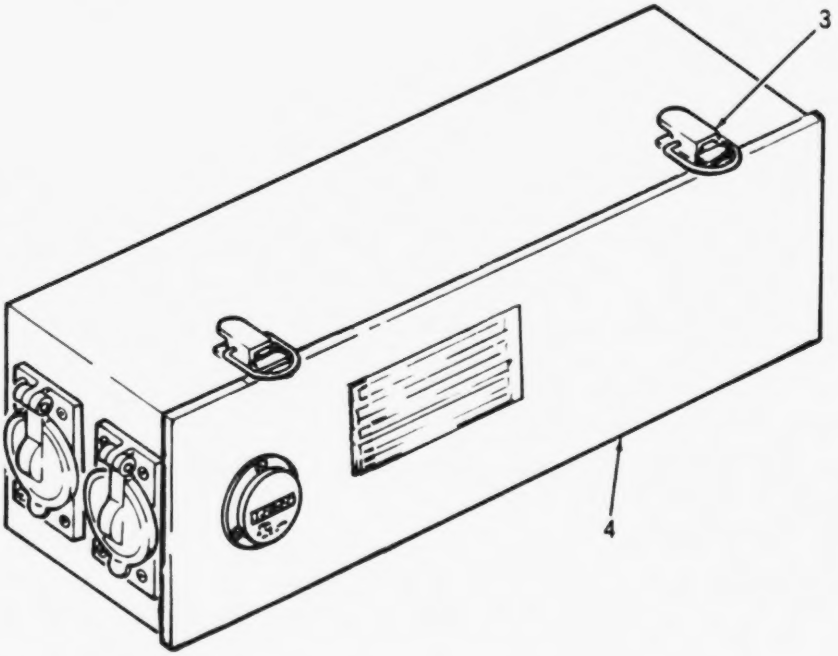


5-7. REPAIR PROCEDURES (CONT'D)

p. Master Control Box Assembly (Cont'd)

37. Close lid (4) and latch using two latches (3).

38. Connect power cable and turn on power switch. (Paragraph 5-6m, Step 1).



CHAPTER 6

GENERAL SUPPORT MAINTENANCE

This chapter contains information on the following:

Section I Repair Parts, Special Tools, Test, Measurement and Diagnostic Equipment and Support Equipment

II General Support Maintenace Procedures

III Drawings

Section I. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

6-1. COMMON TOOLS AND EQUIPMENT

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

6-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

No special tools, TMDE, or support equipment is required for the Bath Unit.

6-3. REPAIR PARTS

Repair parts are listed and illustrated in the Repair Parts and Special Tools List (TM 10-4510-206-24P, to be published) covering general support maintenance for this equipment.

Section II. GENERAL SUPPORT MAINTENANCE PROCEDURES

6-4. GENERAL. This section contains procedures for repairing the bath unit that involve welding, cleaning, and painting assemblies of the bath unit.

6-5. CERTIFICATION. Before welding any assembly of the bath unit, the welder must be certified as a welder of ferrous metals, aluminum, and stainless steel. The certification is based on ASME Boiler and Pressure Vessel Code, Section IX, and meets or exceeds the intent of the following military specifications and standards:

a. MIL-W-52574
b. MIL-STD-1261
c. MIL-T-11407

6-6. REPAIR. Assemblies of the bath unit that require general support maintenance are made up of three types of material; which are: stainless steel, aluminum, and wood. Repair of assemblies containing these types of material require separate processes and procedures for welding, cleaning and painting. Use these procedures to make the repairs.

a. Components Made of Steel. These procedures provide instructions for repairing all assemblies of the bath unit made of steel. These assemblies are:

Water tank
Blower duct
Burner Tube
Filter mounting bracket
Transformer mounting plate
Control box and control box cover
Handle
Flue support
Fuel line holder
Drum fill adapter extension
Smoke pipe elbow assembly
Smoke pipe cap and guard

1. Before welding, throughly clean surface to be welded. Do not use solvent for cleaning.

2. Remove all burrs and sharp edges.

3. Weld damaged area per MIL-W-52574 (ME) Type I.

   (a) Weld rods shall conform to Federal Specifications, E-15599, Class SA 233, 3/32-inch diameter.

   (b) Power source can be ac or dc reverse polarity, 30 to 80 amperes.

   (c) Penetration shall be full, at 14 inches (36cm)/minute welding rate.

   (d) Preheat material to be welded to 50° F(10°C).

   (e) Avoid starts and stops when welding. Chip slag and restarts.

4. Inspect all weld joints for conformance with specification details and for surface uniformity.

5. Grind all welded seams smooth.

6. Hydrostatically test water tank at pressure of 75 psi(517kPa).

7. After welding on water vessel assembly and before nipples are installed on manifold, proceed as follows:

   (a) Plug all ports except one.

   (b) Pour five gallons silicone alkyd heat resistant paint in open port and cap port.

   (c) Rotate water vessel to allow paint to cover area adjacent to weld.

   (d) Drain paint from water vessel and let paint in water vessel dry.

   (e) Repeat steps (c) and (d).

8. Clean all exposed metal surfaces (item 21, Appendix).

9. Apply one coat of primer (item 16, Appendix E).

10. Apply finish coat (item 17, Appendix E), per FED STD 595.

b. Components Made of Aluminum. These procedures provide instructions for repairing all assemblies of the bath unit made of aluminum. These assemblies are:

Water heater skid
Water pump frame
Suction strainer assembly
Shower leg holder bracket
Shower stand leg
Shower stand soap dish

1. Before welding, thoroughly clean surface to be welded by brushing with stainless steel wire brush.

2. Weld damaged area per MIL-W-45206A (MR) Class B.

   (a) Weld rods shall conform to AWS AS, 10-61T Federal Specification QQ-R-566A Class 4043, 3/32-inch diameter.

   (b) Power source shall be ac, 25 to 115 amperes.

   (c) Use Argone Inert Shielding gas at 20 cubic feet per hour, using 3/8 inch gas cup and short arc to ensure good gas coverage.

   (d) Penetration shall be full, at 10 inches (25 cm) per minute welding rate.

   (e) Preheat material to be welded to 50°F (10°C).

3. Inspect all weld joints for conformance with specification details and for surface uniformity.

4. Grind all welded surfaces smooth.

5. Clean all exposed metal surfaces using compound MIL-C-10578 (Type I or II) or MIL-C-5541 (item 21, Appendix E).

6. Apply one coat of primer TT-P-636 (item 16, Appendix E).

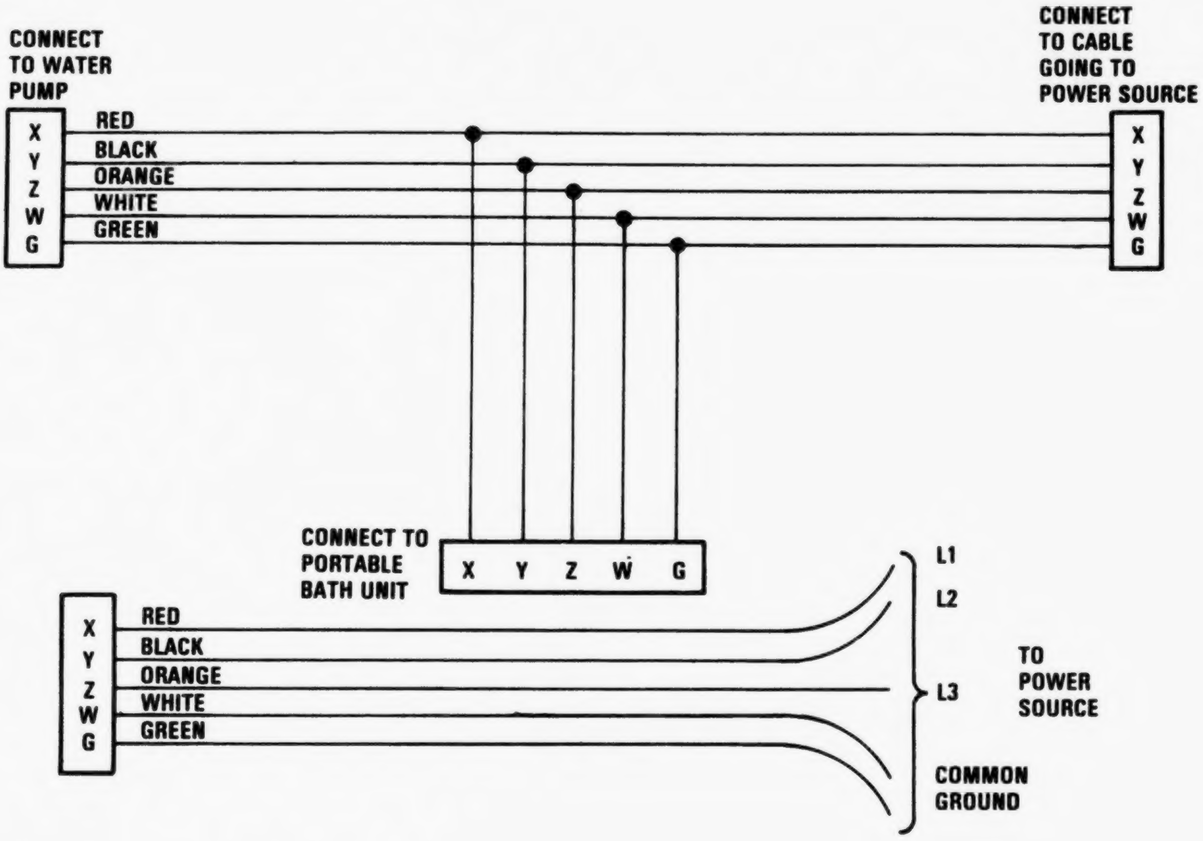
7. Apply finish coat MIL-E-52798 Color Forest Green (color code 34079) per FED STD 595 (item 17, Appendix E).

c. Components Made of Wood (Shipping Containers). See chapter 4 for repair of hinges, latches, and handles and for painting.

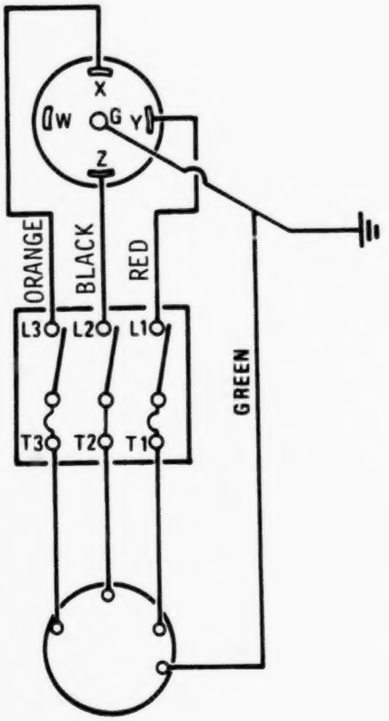
Section III. DRAWINGS

This section contains drawings for reference when making electrical repairs to the Bath Unit. The drawings are:

6-1-6267	Water Pump Assembly Wiring Diagram
6-1-6270	Power Cable Assembly Wiring Diagram
6-1-6295	Water Heater Assembly Wiring Diagram (FO-1)



Power Cable Assembly Wiring Diagram



Water Pump Assembly Wiring Diagram

APPENDIX A

REFERENCES

A-1. SCOPE

This appendix lists all forms, field manuals, technical manuals and miscellaneous publications referenced in this manual.

A-2. FORMS

Quality Deficiency Report	SF 368
Recommended Changes to DA Publications	DA Form 2028-2
Uncorrected Fault Record	DA Form 2408-14
Vehicle Accident Report	SF 91

A-3. FIELD MANUALS

Northern Operations	FM 31-71

A-4. TECHNICAL MANUALS

Organizational, Direct Support and General Support Repair Parts: Bath Unit, Automated, Multi-Head	TM 10-4510-206-24P (To be published)
Operator's, Organizational, Direct Support and General Support Maintenance Manual: Generator Set, 3 KW, 60 HZ	TM 5-6115-271-14
Organizational, Direct Support and General Support Repair Parts: Generator Set	TM 5-6115-271-24P
Packaging of Material, Preservation	TM 38-230-1
Welding: Theory and Application	TM 9-237
Administrative Storage of Equipment	TM 740-90-1
Procedures for Destruction of Equipment to Prevent Enemy Use (Mobility Equipment Command)	TM 750-244-3

A-5. MISCELLANEOUS PUBLICATIONS

The Army Maintenance Management System (TAMMS)	DA Pam 738-750
Engine, Gasoline, 6 HP Military Standard Model 4A032-1 and Model 4A032-2 (LC 38G2-90-1)	LO 5-2805-203-12

A-6. MILITARY SPECIFICATIONS AND STANDARDS

Hand Portable Fire Extinguishers for Army Users	TB 5-4200-200-10
Schistosomiasis	TB MED 167
Color, Marking, And Mamouflage Patterns Used on Military Equipment Managed by TSARCOM	TB 43-0147
Fuels, Lubricants, Oils, and Waxes	C9 100IL
Dry Cleaning Solvent	FED Spec P-D-680
Cleaning Compound	MIL-C-10578 (Type I or II)
Primer Coat Paint (Aluminum)	TT-P-636 or MIL-C-5541
Primer Coat Paint (Steel)	TT-P-636 or TT-C-490
Primer Coat Paint (Wood)	TT-W-572
Finish Coat Enamel Paint (Metal)	MIL-E-52798 Color Forest Green (color code 34079)
Standard for Applying Finish Coat	FED STD 595
Finish Coat Enamel Paint (Wood)	TT-E-529, Class A, Color Olive Drab No. 24803
Welding, Aluminum	MIL-W-45206A
Welding, Steel	MIL-W-52574 (ME), Type I

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. GENERAL

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance categories.

b. The maintenance allocation chart (MAC) in section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the special tools and test equipment required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions and explanatory notes fo a particular maintenance function.

B-2. MAINTENANCE FUNCTIONS - Maintenance functions will be limited to and defined as follows:

a. Inspect - To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).

b. Test - To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristic of an item and comparing those characteristics with prescribed standards.

c. Service - Operations required periodically to keep an item in proper operating condition, i.e., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids or gases.

d. Adjust - To maintain or regulate, within prescribed limits, by bringi into proper or exact position, or by setting the operating characteristics to specified parameters.

e. Aline - To adjust specified variable elements of an item to bring abo optimum or desired performance.

f. Calibrate - To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of wh is a certified standard of known accuracy, to detect and adjust any discrepan in the accuracy of the instrument being compared.

g. Remove/Install - To remove and install the same item when required t perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace - To remove an unservicable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and is shown as the third poisiton code of the SMR code. This is found in the repair parts manual.

i. Repair - The application of maintenance services, including fault location/troubleshooting[2], removal/installation, and disassembly/assembly[3] procedures, and maintenance actions[4] to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul - That maintenance effort (service/action) necessary to restore any item to a completely serviceable/operational condition as prescribed by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like-new condition.

k. Rebuild - Consists of those services/actions necessary for the restoration of unserviceable equipment to a like-new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipment/components.

B-3. EXPLANATION OF COLUMNS IN THE MAC, SECTION II

a. Column 1, Group Number - Column 1 lists functional group code numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly - Column 2 contains the name of components, assemblies, subassemblies, and modules for which maintenance is authorized.

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[1] Services - inspect, test, service, adjust, aline, calibrate, and/or replace.

[2] Fault locate/troubleshoot - The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or unit under test (UUT).

[3] Disassemble/assemble - encompasses the step-by-step taking aprat (or breakdown) of a spare/functional group coded item to the level of its least componency identified as maintenance significant (i.e., assigned an SMR code) for the category of maintenance under consideration.

[4] Actions - welding, grinding, riveting, straightening, facing, remachinery, and/or resurfacing.

c. Column 3, Maintenance Function - Column 3 lists the functions to be performed on the item listed in column 2. (For detailed explanation of these functions, refer to paragraph B-2).

d. Column 4, Maintenance Category - Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn(s), the category of maintenance authorized to perform the function performed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or the complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate work time figures will be shown for each category. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition uner typical field operating conditions. This time includes preparation, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance categories are as follows:

C - operator or crew
O - organizational maintenance
F - direct support maintenance
H - general support maintenance
D - depot maintenance

e. Column 5, Tools and Equipment - Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, TMDE, and support equipment required to perform the designated function.

f. Column 6, Remarks - This column shall, when applicable, contain a letter code, in alphabetic order, which shall be keyed to the remarks contained in section IV.

B-4. EXPLANATION OF COLUMNS IN TOOL AND TEST EQUIPMENT REQUIREMENTS, SECTION III.

a. Column 1, Reference Code - The tool and test equipment reference code correlates with a code in the MAC, section II, column 5.

b. Column 2, Maintenance Category - The lowest category of maintenance authorized to use the tool or test equipment.

c. Column 3, Nomenclature - Name or identification of the tool or test equipment.

d. Column 4, National Stock Number - The national stock number of the tool or test equipment.

e. Column 5, Tool Number - The manufacturer's part number.

B-5. EXPLANATION OF COLUMNS IN REMARKS, SECTION IV

a. Column 1, Reference Code - The code recorded in column 6, section II.

b. Column 2, Remarks - This column lists information pertinent to the maintenance function being performed as indicated in the MAC, section II.

SECTION II. MAINTENANCE ALLOCATION CHART
FOR
BATH UNIT, PORTABLE

(1) Group Number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance Level C	 O	 F	 H	 D	(5) Tools and equipment	(6) Remarks
00	Bath Unit, Portable	Overhaul					33		B
01	Miscellaneous Assys								
	Power Cable Assy.	Inspect Test Replace Repair	0.1	0.1 0.2 0.5	 1.0			1,2	A
	Suction Strainer Assy.	Inspect Replace	0.1	0.1 0.2				1	A
	Water Hose Assy	Inspect Replace Repair	0.1	 0.5 0.9				1	A
	Smoke Stack and Guard Assy.	Inspect Repair	0.2	 1.0				1	A
	Fuel Hose Assy.	Inspect		0.2				1	
	Drum Fill Adapter Assembly	Inspect Repair		0.2 1.0				1	A
	Shipping Container Assys.	Replace Repair		0.1	 0.6			1	
02	Shower Stand Assy.	Inspect Replace Repair	0.2	0.2 0.3 1.5	 1.0			1	A

SECTION II. MAINTENANCE ALLOCATION CHART
FOR
BATH UNIT, PORTABLE

(1) Group Number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance Level					(5) Tools and equipment	(6) Remarks
			C	O	F	H	D		
03	Mixing Valve Assy.	Service			0.2			1	A
		Adjust		0.5					
		Replace		0.5					
		Repair			1.5				
04	Water Pump Assy.								
	Water Inlet Assy.	Inspect		0.2				1	A
		Service		0.6					
		Replace		0.6					
		Repair		0.5					
	Water Outlet Assy.	Repair		0.8				1	A
	Electrical Assy.	Repair		0.8				1,2	A
	Water Pump and Motor Assy.	Replace		1.5				1	A
		Repair			2.0				
	Frame Assy.	Replace		0.8				1	A
05	Water Heater Assy.								
	Fuel Supply Control Assy.	Inspect	0.2	0.2				1	A
		Remove/Install		0.7					
		Repair		0.6					
	Burner Head Assy	Inspect		0.3				1,2	A
		Remove/Install		0.7					
		Repair		1.5					

SECTION II. MAINTENANCE ALLOCATION CHART FOR BATH UNIT, PORTABLE

(1) Group Number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance Level					(5) Tools and equipment	(6) Remarks
			C	O	F	H	D		
	Ignition Transformer Assy.	Test Replace Repair		 1.0	0.3 0.5			1,2	A
	Electrical Assy.	Repair		1.0				1,2	A
	Temperature Limit Control Assy.	Adjust		0.7				1	A
	Manifold Assy	Inspect Repair		0.1 0.5				1	A
	Ignition Cable Assy.	Inspect Replace	0.1	 0.5				1,2	A
	Blower and Motor Assy.	Inspect Replace Repair	0.1	0.1 1.5	 4.0			1,2	A
	Blower and Fuel Pump Motor	Replace		1.0				1	A
	Fuel Filter Assembly	Replace		0.5				1	A
	Fuel Pump Assy.	Inspect Service Adjust Replace Repair	0.1	0.3 0.1 0.2 0.8	 1.0			1	A
	Air Shutter Assy.	Inspect Repair	0.1	 0.5				1	A
	Boiler Tank and Skid Assembly	Inspect Service Replace Repair	 0.1	0.1 1.0	 1.5	 0.5 1.5		1 3	A

SECTION II. MAINTENANCE ALLOCATION CHART
FOR
BATH UNIT, PORTABLE

(1) Group Number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance Level					(5) Tools and equipment	(6) Remarks
			C	O	F	H	D		
	Load Limit Switch Assy.	Inspect	0.1					1,2	A
		Repair			0.8				
	UV Scanner and Flame Safeguard Control Assy.	Inspect		0.2				1,2	A
		Test			0.4				
		Repair			1.0				
	Printed Circuit Card	Replace			0.8			1	A
	Operating Limit and High Limit Control Assys.	Adjust			0.4			1,2	A
		Replace			0.5				
	Low Water Probe Assy.	Replace			0.7			1,2	A
	Master Control Box Assy.	Inspect			0.3			1,2	A
		Test			0.9				
		Repair			1.5				
06	Fire Extinguisher	Inspect		0.1					
07	Grounding Assy.	Inspect		0.3					

Section III. TOOLS AND TEST EQUIPMENT

TOOLS OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/ NATO STOCK NUMBER	TOOL NUMBER
1.	O, DA	Tool Set, General	5180-00-209-6225	
2.	O	Multimeter, AN/URM-105	6625-00-581-2036	
3.	GS	Tool Set, Welding	5180-00-754-0061	

SECTION IV. REMARKS

REFERENCE CODE	REMARKS
A	All repair and replacement of parts performed by organizational maintenance limited to authorized items in TM 10-4510-206-24P (to be published).
B	Time for overhaul is for replacement of all parts. For specific times for individual parts see DMWR 10-4510-206.

APPENDIX C

COMPONENTS OF END ITEM AND BASIC ISSURE ITEMS

Section I. INTRODUCTION

C-1. SCOPE

This appendix lists components of end item and basic issue item for the bath unit to help your inventory items required for safe and efficient operation.

C-2. GENERAL

The components of End Item and Basic Issue Items Lists are divided into the following sections.

a. Section II. Components of End Item - This listing is for informational purposes only, and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

b. Section III. Basic Issue Items - These are the minimum essential items required to place the (Bath Unit) in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, BII must be with the (Bath Unit) during operating and whenever it is transferred between property accounts. The illustrations will assist you with hard-to-identify items. This manual is your authority to request/requisition replacement BII, based on TOE/MTOE authorization of the end item.

C-3. EXPLANATION OF COLUMNS

The following provides an explanation of columns found in the tabular listings:

a. Column (1) - (Not applicable in this technical manual).

b. Column (2) - National Stock Number. Indicates the National stock number assigned to the item and will be used for requisitioning purposes.

c. Column (3) - Description. Indicates the Federal item name and, if required a minimum description to identify and locate the item. The last line for each item indicates the FSCM (in parentheses) followed by the part number.

d. Column (4) - Unit of Measure (U/M). Indicates the measure used in performing the actual operational/maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g. ea, in, pr.)

e. Column (5) - Quantity required (Qty rqr). Indicates the quantity of the item authorized to be used with/on the equipment.

Section II. COMPONENTS OF END ITEM

(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	Usable on Code	(4) U/M	(5) Qty Rqd
		FILL VENT ASSEMBLY		EA	1
		HEATER ASSEMBLY, WATER		EA	1
		MIXING VALVE		EA	1
		POWER WIRE HARNESS			
		Consisting of the following:			
		Connector		EA	1
		Cap, cover		EA	1
		Cable		EA	1
		POWER WIRE HARNESS		EA	1
		Consisting of the following:			
		Connector		EA	2
		Cap, cover		EA	3
		Cable, 104 ft long		EA	1
		Plug		EA	1
		Bushing and Gland Nut		EA	3
		Gang Box, Shallow		EA	1
		Cover		EA	1
		Gang Box		EA	1
		PUMP ASSEMBLY, WATER		EA	1
		SHOWER HEAD ASSEMBLY		EA	9
		SMOKE PIPE, 7-inch		EA	1
		SMOKE PIPE CAP ASSEMBLY		EA	1
		WATER HOSE ASSEMBLY		EA	2
		Consisting of the following:			
		Coupling, Half, Male 1-inch		EA	1
		Coupling, Half, Female 1-inch		EA	1
		Hose, Water, 1-inch		EA	1
		Clamp, Hose, No. 8, 2-1/4 inch ID, 5/8 inch x 0.030. inch band		EA	4

Section II. COMPONENTS OF END ITEM (CONT'D)

(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	Usable on Code	(4) U/M	(5) Qty Rgd
		WATER HOSE ASSEMBLY		EA	4
		Consisting of the following:			
		Coupling, Half, Male 1-inch		EA	1
		Hose, water, 1-inch		EA	1
		Clamp, Hose No. 8, 2-1/4-inch ID x /8-inch x 0.050-inch band		EA	4
		WATER HOSE ASSEMBLY		EA	1
		Consisting of the following:			
		Coupling, Half, Male, 1-1/2-inch		EA	1
		Coupling, Half, Female, 1-1/2-inc		EA	1
		Hose, water, 1-1/2-inch		EA	1
		Clamp, Hose, No. 8, 2-1/4 inch ID, 5/8-inch x 0.030-inch band		EA	1
		strainer, suction, water			
		wind breaker, curtain			
		VALVE ASSEMBLY		EA	9
		Consisting of the following:			
		Bushing		EA	9
		Nipple		EA	9
		Soap Dish		EA	9

Section III. BASIC ISSUE ITEMS

(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	Usable On Code	(4) U/M	(5) Qty Rgd
		TM 10-4510-206-24P (to be published) Operator's, Organizational, Direct Support, and General Support Maintenance Repair Parts and Special Tools List (Including Depot Repair Parts)		EA	1
		TM 5-2805-203-24P Organizational, DS and GS and Depot Maintenance Repair Parts for Engine, Gasoline 6 HP, MILITARY STANDARD MODELS DOD4A032-1 and DOD4-A032-2		EA	1
		LO 5-2805-203-12 LUBRICATION ORDER - Engine Gasoline 6 HP; MILITARY STANDARD MODELS 4A302-1 and 4A302-2		EA	1
		TM 10-4510-206-14 Operator, Organizational, Direct Support and General Support Maintenance Manual		EA	1

APPENDIX D

ADDITIONAL AUTHORIZATION LIST

Section I. INTRODUCTION

D-1. SCOPE

This appendix lists additional items you are authorized for the support of the bath unit.

D-2. GENERAL

This list identifies items that do not have to accompany the bath unit and that do not have to be turned in with it. The items are authorized to you by CTA, MTDE, TDA, or JTA.

D-3. EXPLANATION OF LISTING

National stock number, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. "USABLE ON" codes are identified as follows: (Not Applicable)

Section III. ADDITIONAL AUTHORIZATION LIST

(1) NATIONAL STOCK NUMBER	PART NUMBER & FSCM	Usable on Code	(4) U/M	(5) Qty rgr
5120-00-240-5328	Wrench, Open End Adjustable Size 8		EA	1
5120-00-277-1486	Wrench, Pipe, Adjustable Heavy Duty 2 inch capacity, 14 inch length		EA	2
5120-00-237-6985	Screwdriver, Flat Tip, Plain, Medium Heavy Duty Design A 3/8 inch by 8 inches		EA	1

APPENDIX E

EXPENDABLE SUPPLIES AND MATERIALS LIST

SECTION I. INTRODUCTION

E-1. SCOPE

This appendix lists expendable supplies and materials you will need to operate and maintain the Bath Unit. These items are authorized to you by CTA50-970, Expendable Items (except Medical, Class V, Repair Pars, and Heraldic Items).

E-2. EXPLANATION OF COLUMNS

a. Column 1. Item Number - This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g. "Use dry cleaning solvent, item 4, App. E").

b. Column 2. Level - This column identifies the lowest level of maintenance that requires the listed item.

C - Operator/crew
O - Organizational maintenance
F - Direct Support maintenance

c. Column 3. National Stock Number - This is the national stock number assigned to the item. Use it to request or requisition the item.

d. Column 4. Description - Indiçates the federal item name and, if required, a description to identify the item. The last line for each item indicates the part number followed by the federal supply code for manufacture (FSCM) in parenthesis, if applicable.

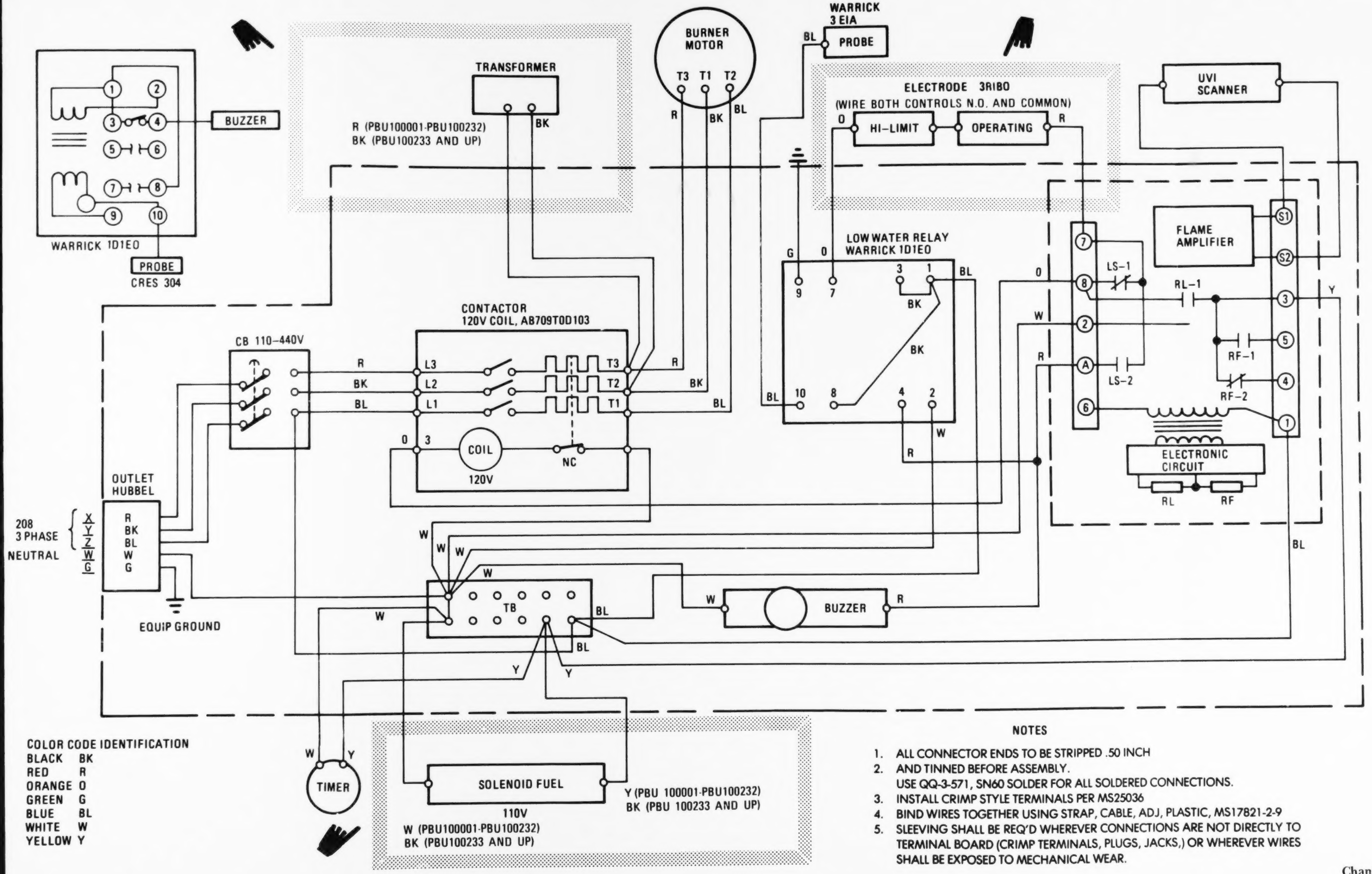
e. Column 5. Units of Measure (U/M) - Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirement.

Section II. EXPENDABLE DURABLE SUPPLIES AND MATERIALS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
1	GS		COMPOUND, CLEANING MIL-C-10578 (Type I or II)	EA
2	C		COMPOUND, SEALING MIL-C-18969	EA
3	C		FUEL, AVGAS MIL-G-5572 (All Grades)	GAL
4	C		FUEL, DIESEL W-F-800 (DF-A, DF-1, DF-2)	GAL
5	C		FUEL. JET MIL-T-5624 (JP-4, JP-5)	GAL
6	C		FUEL, JET MIL-T-83133	GAL
7	C		FUEL, MOGAS MIL-G-3056 (All Grades)	GAL
8	C		FUEL, OIL No. 1 or No. 2 Commercial Grade	GAL
9	C	9130-00-221-0680	GASOLINE, AUTOMOTIVE COMBAT 91A 55 Gal Drum MIL-G-3056 (81349)	GAL
10	C		GREASE, SOFT MIL-G-23827	EA
11	C		LOCTITE MIL-5-46163, Type I, Grade L	EA
12	C	9150-00-188-9858	LUBRICATING OIL, ENGINE, OE30 5 Gal. Pail	GAL
13	C	9150-00-186-6668	LUBRICATING OIL, ENGINE, OE10 5 Gal. Pail MIL-L-2104 (81349)	GAL
14	O		PAINT, ENAMEL MIL-E-52798, Forest Green Color Code 34079	EA

Section II. EXPENDABLE DURABLE SUPPLIES AND MATERIALS LIST (CONT'D)

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
15	O,GS		PAINT, ENAMEL TT-E-529, Color Olive Drab Class A	EA
16	GS		PRIMER, TT-P-636	EA
17	O,GS		PRIMER, TT-W-572	EA
18	C		SEALER, 3M MIL-M-22473D, Grade AB	EA
19	C	6850-00-664-5683	SOLVENT, DRY CLEANING 1 Qt Cans FED SPEC P-D-680	QT
20	C		TAPE PPP-T-60, Type III, Class I	EA
21	O		THREAD, POLYESTER V-T-285, Type I, Class I	EA



COLOR CODE IDENTIFICATION

BLACK	BK
RED	R
ORANGE	O
GREEN	G
BLUE	BL
WHITE	W
YELLOW	Y

NOTES

1. ALL CONNECTOR ENDS TO BE STRIPPED .50 INCH
2. AND TINNED BEFORE ASSEMBLY.
   USE QQ-3-571, SN60 SOLDER FOR ALL SOLDERED CONNECTIONS.
3. INSTALL CRIMP STYLE TERMINALS PER MS25036
4. BIND WIRES TOGETHER USING STRAP, CABLE, ADJ, PLASTIC, MS17821-2-9
5. SLEEVING SHALL BE REQ'D WHEREVER CONNECTIONS ARE NOT DIRECTLY TO TERMINAL BOARD (CRIMP TERMINALS, PLUGS, JACKS,) OR WHEREVER WIRES SHALL BE EXPOSED TO MECHANICAL WEAR.

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By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

ROBERT M. JOYCE
Major General, United States Army
The Adjutant General

DISTRIBUTION:
To be distributed in accordance with DA Form 12-25A, Operator Maintenance Requirements for Shower and Bath.

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THEN. . JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT. FOLD IT AND DROP IT IN THE MAIL!

SOMETHING WRONG WITH THIS PUBLICATION?

FROM (PRINT YOUR UNIT'S COMPLETE ADDRESS)

PFC JOHN DOE
CO A, 3d ENGINEER BN
FT. LEONARDWOOD, MO 63108

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 10-4510-206-14	6 Jul 84	Bath Unit, Portable

BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO	IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
6	2-1 a			In line 6 of paragraph 2-1a the manual states the engine has 6 cylinders. The engine on my set only has 4 cylinders. Change the manual to show 4 cylinders.
81		4-3		Callout 16 on figure 4-3 is pointing at a bolt. In key to figure 4-3, item 16 is called a shim - Please correct one or the other.
125	line	20		I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered, so the NSN is wrong. Please give me a good NSN

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

JOHN DOE, PFC (268) 317-7111

SIGN HERE John Doe

JOHN DOE

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U S ARMY TROOP SUPPORT COMMAND
ATTN: DRSTR-MPS
4300 GOODFELLOW BOULEVARD
ST. LOUIS, MO 63120

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C